Government
Publications

Ontario. Legislative assembly.
Sessional papers.

SESSIONAL PAPERS

VOLUME XLI.—PART VI.

First Session of Twelfth Legislature

OF THE

PROVINCE OF ONTARIO

SESSION 1909

TORONTO:
Printed and Published by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1909

Printed by WARWICK BROS & RUTTTER, Limited,
TORONTO

1091088

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No. 2.... Estimates for the service of the Province until the Estimates of the year are finally passed. Presented to the Legislature, 17th February, 1909. *Not Printed.* Estimates for the ten months ending 31st October, 1909. Presented to the Legislature, 2nd March, 1909. *Printed.* Estimates (Supplementary) for the year 1909. Presented to the Legislature, 29th March, 1909. *Printed.* Estimates for the year ending 31st October, 1910. Presented to the Legislature, 29th March, 1909. *Printed.*

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No. 6.... Report of the Minister of Public Works, for the year 1908. Presented to the Legislature, 19th March, 1909. *Printed.*

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No. 16... Report of the Fruit Grower's Association of Ontario, for the year 1908. Presented to the Legislature, 2nd April, 1909. *Printed.*

No. 17... Report of the Fruit Branch of the Department of Agriculture, for the year 1908. Presented to the Legislature, 8th April, 1909. *Printed.*

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No. 20... Report of the Ontario Bee-Keepers' Associations, for the year 1908. Presented to the Legislature, 1st April, 1909. *Printed.*

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No. 24... Report of the Women's Institutes of Ontario, for the year 1908. Presented to the Legislature, 26th February, 1909. *Printed.*

No. 25... Report of the Farmers' Institutes of Ontario, for the year 1908. Presented to the Legislature, 26th February, 1909. *Printed.*

No. 26... Report of the Agricultural Societies of Ontario, and the Convention of the Ontario Association of Fairs and Exhibitions, for the year 1908. Presented to the Legislature, 26th February, 1909. *Printed.*

No. 27... Report of the Horticultural Societies of Ontario, for the year 1908. Presented to the Legislature, 1st April, 1909. *Printed.*

No. 28... Report of the Bureau of Industries of Ontario, for the year 1908. Presented to the Legislature, 1st April, 1909. *Printed.*

No. 29... Report of the Inspectors of Factories of Ontario, for the year 1908. Presented to the Legislature, 1st April, 1909. *Printed.*

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No. 34... Report upon the Archives of the Province, for the year 1908. Presented to the Legislature, 6th April, 1909. *Printed.*

No. 35... Report on Neglected and Dependent Children in Ontario, for the year 1908. Presented to the Legislature, 30th March, 1909. *Printed.*

No. 36... Report of the Provincial Board of Health, for the year 1908. Presented to the Legislature, 16th March, 1909. *Printed.*

No. 37... Report of the Inspector of Division Courts, for the year 1908. Presented to the Legislature, 29th March, 1909. *Printed.*

No. 38... Report of the Inspector of Legal Offices, for the year 1908. Presented to the Legislature, 22nd March, 1909. *Printed.*

No. 39... Report of the Inspector of Registry Offices, for the year 1908. Presented to the Legislature, 6th April, 1909. *Printed.*

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No. 43... Report upon the Hospitals and Charities of Ontario, for the year ending 30th September, 1908. Presented to the Legislature, 2nd April, 1909. *Printed.*

No. 44... Report upon the Operation of the Liquor License Acts in Ontario, for the year 1908. Presented to the Legislature, 26th February, 1909. *Printed.*

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No. 47... Report of the Librarian on the state of the Library. Presented to the Legislature, 17th February, 1909. *Not Printed.*

No. 48... Report of the Hydro-Electric Power Commission of the Province, for the year 1908. Presented to the Legislature, 7th April, 1909. *Printed.*

No. 49... Report shewing expenditure and account of Construction, Right-of-Way purchased and Equipment, owned by the Temiskaming and Northern Ontario Railway Commission. Presented to the Legislature, 12th March, 1909. *Printed.*

No. 50... Northwest Angle Treaty No. 3. Claims made by the Government of Canada, against Ontario. Presented to the Legislature, 6th April, 1909, *Printed.*

No. 51... Bulletin of the Toronto Hospital for the Insane in the interests of Psychiatry in Ontario. Presented to the Legislature, 12th March, 1909. *Printed for distribution only.*

No. 52... Copies of Orders-in-Council passed since the last Session of the Legislature under Section 27 of the Department of Education Act. Presented to the Legislature, 26th February, 1909. *Not printed.*

No. 53... Return to an Order of the House of the Third day of March, 1909, for a Return shewing :—1. The number of Public School Inspectors in the organized Counties of Ontario. 2. Number of Schools under Inspector. 3. The amount of money paid to such Inspectors. 4. The amount of money paid by the County as required by the Act. 5. Total amount of expenses paid by the Counties. 6. Average amount of salary and expenses paid each Inspector by both County and Government. Presented to the Legislature, 12th March, 1909. Mr. *Ferguson (Simcoe.) Printed.*

No. 54... Certain Agreements, made in duplicate, for the supply of printing paper required by the Government, for the term of three years, computed from the first day of January, 1909. Presented to the Legislature, 12th March, 1909. *Printed.*

No. 55... Copies of Orders-in-Council under the provisions of section 187 of "The Judicature Act," and sub-section 2 of section 84 of the "Surrogate Court Act." Presented to the Legislature, 12th March, 1909. *Not Printed.*

No. 56... Return to an Order of the House of the Third day of March, 1909, for a Return shewing :—1. The name of all the Collegiate Institutes, High Schools and Continuation Classes in the Province. 2. Which of these Schools were classed "Approved," in the Academic year, July, 1907, to July, 1908. 3. The change (if any) made in the classification of each such school since July 1st, 1908, to date. 4. The reasons for such change in classification. Presented to the Legislature, 25th March, 1909. Mr. *Stock. Not Printed.*

No. 57... Return of an Order of the House of the Fifteenth day of March, 1909, for a Return from the Master of Titles under the Land Titles Act for the last three years, shewing :—1. Number of absolute and qualified entries of ownership. 2. Number of possessory entries of ownership. 3. Amount added to the Assurance Fund. 4. Total amount of Assurance Fund. 5. The accumulated interest from time to time added. 6. Total losses charged against Insurance Fund. 7. Number of Transfers. 8. Number of Mortgages. 10. Number of leases. 10. Amount of Fees received. 11. Salaries and other expenses of Management. 12. Amount paid by the City of Toronto and County of York to make up deficits in running expenses during the last ten years. Presented to the Legislature, 29th March, 1909. Mr. *McPherson. Not Printed.*

No. 58... Report and Census on the Feeble Minded in Ontario. Presented to the Legislature, 6th April, 1909. *Printed.*

No 59... Statement of the distribution of the Revised and Sessional Statutes, 1897 to 1908. Presented to the Legislature, 31st March, 1909. *Not Printed.*

No. 60... Report of the Corn Grower's Association of Ontario, for the year 1908. Presented to the Legislature, 1st April, 1909. *Printed.*

No. 61... Report of the Department of Agriculture of Ontario, for the year 1908. Presented to the Legislature, 1st April, 1909. *Printed.*

No. 62... Report on Farming Opportunities in Ontario, with list of improved Farms for sale. Presented to the Legislature, 1st April, 1909. *Printed for distribution only.*

No. 63... Return to an Order of the House of the Nineteenth day of March, 1909, that the Report of Mr. Starr, who was appointed a Commissioner to enquire into certain matters relating to liquor licenses in the City of Toronto, which has not been printed for public distribution, the original Report be laid upon the Table of the House. Presented to the Legislature, 1st April, 1909. Mr. *Ross* (*Middlesex.*) *Not Printed.*

No. 64... Return to an Order of the House of the Tenth day of March, 1909, for a Return shewing :—Concerning each appointment made by the Government to any educational office, or employment, since the Government's inception of office. 1. Name of appointee. 2. Date of appointment. 3. Nature of employment or office. 4. Outline of duties pertaining thereto. 5. The salary paid. 6. If teacher, master or professor : (*a*) His academic standing. (*b*) The kind of school or schools in which his experience was obtained, and the length of it. (*c*) His professional status, and stating the kind of training school in which he was trained. 7. Concerning the office of Inspector since the creation of the office, and as to such official : (*a*) What previous experience in inspection had he. (*b*) His academic and professional standing qualifying him for his duties. 8. If not holding his engagement still, how was it severed. Presented to the Legislature, 1st April, 1909. Mr. *Stock. Not Printed.*

No. 65... Report upon the Hospitals for the Idiotic and Epileptic of Ontario for the year 1908. Presented to the Legislature, 1st April, 1909. *Printed.*

No. 66... Return to an Order of the House of the Fifth day of April, 1909, that the Report of the Commissioner who held the recent enquiry into the conduct of W. R. Andrews, the License Inspector of East Elgin, together with the evidence on which the same is based, be laid upon the Table of the House. Presented to the Legislature, 6th April, 1909. Mr. *Bowyer. Printed.*

No. 67... Return to an Order of the House of the Eighth day of March, 1909, for a Return shewing :—1. When a branch or sub-department of Forestry was established under the Government of Ontario. 2. The names and duties of all officials and employees of the said branch or sub-department in each year since and including the year 1905. 3. Name of any and all officials of the Government of Ontario whose duty it is to deal with forest conservation or re-forestation or either of them, together with a copy of the Orders-in-Council appointing said officials and copies of regulations defining their duties. 4. A statement, in detail, of the lands that have been set aside as forest reserves since the beginning of the year 1905, giving the location and acreage of each. 5. A statement in detail of the lands set aside for re-forestation since the beginning of the year 1905, giving the location and acreage of each. Presented to the Legislature, 6th April, 1909. Mr. *MacKay* (*Grey.*) *Not printed.*

No. 68... The James Bay Treaty, No. 9, with pay list for 1906. Presented to the Legislature, 6th April, 1909. *Printed.*

No. 69... Return to an Order of the House of the Fifth day of March, 1909, for a Return shewing :—1. How many licenses to operate motor vehicles in the Province was granted during the year 1908. 2. How many of these were granted to non-residents and how many to residents of this Province. 3. Were special Constables appointed by the Provincial Government to enforce the Motor Vehicle Law. If so, how many. 4. What expense in regard to their services or otherwise was undertaken by the Government in that regard. 5. How many convictions were made for breaches of the law. 6. How many were through the efforts of said Constables, if any. 7. What was the nature of the offences, and what number of convictions were secured under each. 8. What number of these convictions were against non-residents. Presented to the Legislature, 8th April, 1909. Mr. *Ross* (*Middlesex*.) *Not printed.*

No. 70... Return to an Order of the House of the Twenty-fourth day of March, 1909, for a Return shewing :—1. How many Emigrants the Salvation Army brought out from Great Britain and Ireland during the season of 1908. 2. How many were male and how many female. 3. How many were placed in the homes of the farmers of the Province of Ontario. 4. The names and addresses of the farmers, and if those so placed remained; how long, with names and addresses of any still remaining. Also, shewing :—1. How many Emigrants the Government of this Province brought out from Great Britain and Ireland during the season of 1908. 2. How many were male and how many female. 3. How many were placed in the homes of the farmers of the Province of Ontario. 4. The names and addresses of the farmers, and if those so placed remained, and if so, how long ; with the names and addresses of any still remaining. Also, shewing :—1. How many farmers the Government induced to come to the Province of Ontario during the year 1908. 2. How many rented, leased, or purchased farms. 3. How many are still on the farms, and if not, why. 5. Shewing any who took up government land, and if so, if they purchased it or acquired it on the homesteading plan. 7. The names and addresses of such farmers. Presented to the Legislature, 8th April, 1909. Mr. *Studholme*. *Not printed.*

THIRTY-FOURTH ANNUAL REPORT

OF THE

Ontario Agricultural College

AND

Experimental Farm

1908

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:

Printed by L. K CAMERON, Printer to the King's Most Excellent Majesty.

1909.

Printed by WARWICK BROS. & RUTTTER, Limited,
TORONTO

la A.C

To the Honourable JOHN MORISON GIBSON, K.C., LL.D., etc., etc., etc.,
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present for the consideration of Your Honour, the Report of the Ontario Agricultural College and Experimental Farm for 1908.

Respectfully submitted,

JAMES S. DUFF,
Minister of Agriculture.

THE ONTARIO AGRICULTURAL COLLEGE, GUELPH, ONT.

Hon. James S. Duff, *Minister of Agriculture, Toronto, Ont.*

FACULTY OF INSTRUCTION, 1909.

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Mrs. Cunningham .....Matron Agricultural College.
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ONTARIO AGRICULTURAL COLLEGE

AND EXPERIMENTAL FARM.

To the Honorable the Minister of Agriculture:

SIR,—I have the honor to submit herewith the thirty-fourth annual report of the Ontario Agricultural College and Experimental Farm, including the report of the Macdonald Institute, for the year 1908.

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Ontario Agricultural College.

PART I.

THE PRESIDENT.

Again we have to record a larger attendance than ever before in any one year. From the 1st of January, 1908, until the 31st of December of the same year, there were 1,225 separate and distinct students who received more or less instruction in one or more of our departments. This means that the classes have been larger and the work of the professors, lecturers, demonstrators, and other officers very much increased. We believe that better work is being done every year, and we are well pleased with the progress made by the students during the past twelve months.

Changes in the Staff.

I am pleased to record, also, that during the past year there have been fewer changes than usual in the College staff. Many of our men have been offered better positions elsewhere, but for family reasons or for patriotic reasons, or both, they have seen fit to remain with us, and we are distinctly the gainers thereby.

The following changes have taken place during the year:

In the department of Bacteriology, Mr. B. Barlow, who has been with us so many years, on account of ill health resigned his position as lecturer and returned to his home in Michigan. We regret the loss of Mr. Barlow, as he was one of our strong scientific men, an indefatigable worker, and a first-class botanist, as well as bacteriologist. Mr. D. H. Jones, of last year's graduating class, was appointed to succeed Mr. Barlow in the department of Bacteriology.

A new position was created, known as Specialist in Plant Diseases. This was filled by the appointment of Mr. L. Caesar, one of our matured students and an old teacher; also a member of last year's graduating class. Mr. Caesar has been attached to the department of Entomology and Zoology and is investigating and offering remedies for plant diseases and insect ravages in field and orchard throughout the Province of Ontario.

Mr. R. R. Graham, who so efficiently filled the position of Resident-Master for one year, resigned at the beginning of the session to go back into his fourth year. He was succeeded by Mr. G. M. Frier, of last year's graduating class. I am pleased to say that Mr. Frier is giving excellent satisfaction in the College Residence.

Home Economics.

Again the work of the Macdonald Institute is meeting with favor throughout the length and breadth of this land, and applications are also coming in and some students are being admitted from other countries.

Macdonald Hall has been filled to its utmost capacity, and although more than thirty girls are completing their work and leaving the Hall at Christmas time, every room has been taken for the new term commencing January 5, and we have had to refuse a number of applications for rooms.

College Work and Progress.

As will be seen from the report of the Dean of Residence, the boys' dormitory was again filled, every bed being taken and seventy-two regular students, in addition, being obliged to board outside. We shall, at a very early date, be obliged to make arrangements for further residence space for students.

The bulletins prepared during the year by members of the College Staff and published by the Department of Agriculture are as follows:

162. "Breakfast Foods: Their Chemical Composition, Digestibility, and Cost," by R. Harcourt and H. L. Fulmer.

163. "Incubation of Chickens," by W. R. Graham, W. H. Day, C. C. Thom, R. Harcourt, and H. L. Fulmer.

164. "Legume Bacteria," by S. F. Edwards and B. Barlow.

165. "Alfalfa or Lucerne," by C. A. Zavitz.

168. "The Perennial Sow Thistle and Some Other Weed Pests," by J. E. Howitt.

Short Courses.

These courses continue very popular. Even the Short Course in Horticulture, provided in January of this year for the first time, was well attended and much enthusiasm was shown in the work. The attendance at these Courses was as follows: Dairy Courses, 42; Two Weeks' Course in Stock and Seed Judging, 328; Two Weeks' Course in Horticulture, 78; Four Weeks' Course in Poultry Raising, 19; One-month Course in Domestic Science, 12; One-month course in Elementary Agriculture and Nature Study, 49; One-month course in Manual Training, 18.

Stock Judging.

Greater interest each year is being taken in the judging of live stock. This has been stimulated by student competition at our own Winter Fair in Guelph and intercollegiate competition at the International Live Stock Exposition in the city of Chicago. At the Winter Fair more than ninety students competed this year, with the result shown in another column. The team that visited Chicago this year were also well trained but were not successful in taking any of the prizes. At this show the competition is growing keener each year, the men of other colleges are being better trained, and perhaps the wonder is that our students won three times in succession, 1905, 1906, and 1907, rather than that we should not stand first in 1908.

Excursions.

The month of June was again devoted to Farmers' Institute excursions, and large numbers came from the different parts of the Province and systematically visited the different departments of the College and Farm. The College also entertained the members of many organizations, directly or indirectly interested in the work, and during the year the following associations visited us:

Feb. 19—Legislative Assembly of Ontario.
March 7—Canadian Press Association.
May 29—Waterloo and Berlin Teachers' Association.
June 4 and 5—Victoria Teachers' Association.
June 8—Galt High School Children.

June 13—Lincoln Teachers' Association.
June 17—S. Brant Rural School Children.
June 22—Durham Teachers' Association.
Aug. 26—Scottish Agricultural Commission.
Oct. 31—Canadian Manufacturers' Association.
Nov. 5 and 6—Canadian Entomological Society.

Women's Institutes.

The organization known as the Women's Institute has become an important factor in rural education. Their annual convention is held at this College, and on December 9 and 10 this year some 800 ladies attended the daily sessions, to listen to the papers read and to take part in the discussions which followed. Miss Van Rensselaer, of Cornell University, Mr. C. C. James, Deputy Minister of Agriculture for Ontario, and Dr. Helen MacMurchy, of Toronto, were the principal speakers from outside the membership of the association.

Experimental Union.

As usual, a large number of ex-students returned to the meeting of the Experimental Union held December 7 and 8. Mr. M. A. Carleton, Cerealist of the Department of Agriculture at Washington, D.C., was the principal speaker brought from outside Ontario, and his instructive talks were appreciated by our people.

On the evening of the 8th of December, at the College Boys' Supper we had the pleasure of entertaining as the guest of the College that distinguished journalist, Mr. J. S. Willison, Editor of the "News," Toronto. Mr. Willison delivered an admirable address to the 500 persons who sat down to supper, representing student, staff, and graduating body.

It is a question in my mind as to whether the work of the Union receives at the time of its annual meeting, the attention it deserves. There is possibly no more important agricultural organization in Ontario, and yet, owing to the fact that we are obliged to begin on Monday, and because the principal days of the Winter Fair come during the same week, it seems impossible to secure at the Union such an attendance as the excellent work of the association should warrant. It is a question whether some other week of the year should not be selected, perhaps at the time of the holding of our short courses in January. At that time there are from 200 to 500 farmers in attendance, and they, together with the students in our regular classes and those in dairying and poultry raising, would insure the officers of the Experimental Union a large attendance of persons interested in their work.

Graduates and Other Ex-Students.

The question is often asked, Do your College boys go back to the Farm? I am pleased to be able to say that the great majority of them do. Since one of the conditions of entrance was made to include at least one year's tuition on a farm we have been admitting from year to year a larger number of practical men who, having tried farming and found it good, have made up their minds to stick to it as life work. Their College Course to them is only a more thorough preparation for farm life and work.

In all classes at the College during the past twelve months we have had 781 men students, most of whom have returned r will return directly to Ontario farms. There are, however, some men each year who, because they

have no farms of their own, or because younger brothers have come on to take their places, or for some other reasons, desire to prepare themselves for professional work in agriculture. Such men complete their four years and take their degree from Toronto University. In last year's graduating class there were thirty, and the following is a list of the positions secured by some of them since graduation:

Archibald, E. S., Lecturer in Animal Husbandry, Agricultural College, Truro, N.S.

Arkell, T. R., Agricultural Editor, "Citizen," Ottawa, Ont.

Atkin, J. P., Agricultural Editor, "Journal," Ottawa, Ont.

Barnet, W. A., Tobacco Specialist, Department of Agriculture, Ottawa.

Bowes, L. A., Agricultural Editor, "Telegram," Winnipeg, Man.

Brown, W. A., Professor of Poultry Husbandry, State Agricultural College, Orono, Maine.

Caesar, L., Specialist in Plant Diseases, Ontario Agricultural College.

Curran, G. B., Editor, "Farm Crops," Winnipeg, Man.

Denniss, F. H., Assistant, Dairy Department, Knoxville, Tenn.

Frier, G. M., Resident-Master, Ontario Agricultural College, Guelph.

Gilmour, J. D., Assistant, Dominion Department of Forestry, Ottawa.

Groh, H., Assistant Entomologist, Central Experimental Farm, Ottawa.

Hare, J. H., Agricultural Specialist for County of Ontario, Whitby.

Hibberd, G., Assistant Agronomist, Agricultural College, Maryland.

Hodson, R. W., Assistant Live Stock Commissioner, Victoria, B.C.

Jones, D. H., Lecturer in Bacteriology, Ontario Agricultural College.

Jull, M. A., Assistant, Experiment Station, West Virginia.

Lewis, E., Assistant to Agricultural Specialist, Essex, Ont.

MacKenzie, D. A., Agricultural Specialist for County of Victoria, Lindsay, Ont.

Murray, C., Director of Agriculture for Newfoundland.

Owen, W. C., Assistant to Agricultural Specialist, Morrisburg, Ont.

Slater, A. E., Science Teacher, Trinity College School, Port Hope, Ont.

Warren, F. B., Assistant to Agricultural Specialist, Galt, Ont.

Winslow, R. M., Agricultural Specialist for Prince Edward County, Picton, Ont.

Students in Household Science at Macdonald Institute.

In a general way the same conditions prevail in our Women's Department. The great majority of our students come from farm or village homes and returning there directly they have completed their course, assist or take charge of the house work. There are others, however, more matured women, who come to us for special preparation to enable them to teach domestic science in our schools. Others take our Professional Housekeeper Course, which is a preparation for the domestic management of large institutions.

The large number of girls returning to their homes in this Province, after receiving practical instruction in shorter or longer courses at Macdonald Institute, must in time materially affect the home life throughout the Province, especially in rural communities.

The following named graduates of Macdonald Institute are now located in positions as follows:—

Miss Bligh—Household Science teacher in Edmonton, Alta.

Miss Bray—Employed by Ontario Provincial Secretary's Department in Hospital for the Insane.

Miss Carlyle—Domestic Science teacher in Brockville public schools.

Miss Davis—Supervisor of sewing, public schools Vancouver, B.C.

Miss Dutcher—Household Science teacher in Prince of Wales College, Charlottetown, P.E.I.

Miss Elliott—Household Science teacher, Normal School, Hamilton.

Miss Gardner—Hospital Dietitian, Columbus, Ohio, U.S.

Miss McDunnough—Housekeeper in Y. W. C. A., Kingston, Ontario.

Miss Jean McKenzie—Housekeeper, Reading Hospital, Reading, Pa.

Miss Mary McLennan—Domestic Science teacher, Albany Guild, Albany, N.Y., U.S.

Miss McManus—Assistant in flour testing Department, Ogilvie Milling Company, Montreal, Que.

Miss Macmillan—Temporary assistant, Macdonald Institute, O.A.C.

Miss Mortimer—Housekeeper, Macdonald College, Que.

Miss Murdoch—Dietitian, Beaver Valley General Hospital, New Brighton, Pa., U.S.

Miss Northrup—Domestic Science teacher in public schools, St. John, N.B.

Miss Powell—Dietitian, St. Barnabas Hospital, Minneapolis, Minn., U.S.

Miss J. D. Ross—Domestic Science teacher, Alma College, St. Thomas.

Miss Steinhoff—Household Science teacher, Normal School, Peterboro.

Miss Warner—Housekeeper, Victoria Hospital, London, Ont.

Buildings Erected During 1908.

A new coal-house, to hold 3,000 tons of coal, has been completed.

A brick house, for the storing of fruit and vegetables, is also finished and occupied.

A large addition to the Engineer's Department has given room for the new boilers, which are now installed.

In connection with the Horticultural Department two new cottages have been built which accommodate the florist and the foreman of the garden.

At the Poultry Department a splendid brick building has been erected for the accommodation of incubators. This has been much needed, as this branch of the work is of very great importance to the poultry raisers of the Province.

The Horticultural Department.

For some years the Professor of Horticulture has been asking that the department be divided and separate work allotted to different heads. Last year the Minister of Agriculture saw fit to make this division, and Prof. Hutt selected as his part of the work Landscape Gardening. The Professor now finds time to give assistance, where requested, to rural schools and civic improvement generally throughout the Province, mainly through the provincial horticultural societies.

The work in Horticulture proper is now under the direction of Mr. J. W. Crow, Lecturer in Horticulture, who has as his assistant in the work, Mr. A. McMeans, who is a specialist in the growing of vegetables. Mr. Hunt remains as College Florist and lectures on Floriculture to the young men in the College classes, as well as to the young ladies in attendance at Macdonald Institute.

Outside Lectures.

A number of excellent lectures were delivered before the members of our student body in Massey Hall at regular intervals during the year. These lectures proved very interesting and instructive, and we are obliged to the following gentlemen for the assistance which they have rendered to us:

Dr. A. H. Abbott, Toronto, Ont.—"Color Sensations;" "Some Recent Investigations into Thought Processes."

Prof. C. A. Chant, Toronto, Ont.—"The Universe of the Stars."

Prof. John Dearness, London, Ont.—"The Field and Method of Nature Study."

Mr. W. D. Hobson, Woodstock, Ont.—"Our Common Birds and Their Songs."

Mr. W. E. Saunders, London, Ont.—"Birds: Their Lives and Habits."

Prof. J. Squair, Toronto, Ont.—"French Painting."

Mr. Frank Yeigh, Toronto, Ont.—"Canada."

Agriculture in Our High Schools.

As reported last year, six young men were appointed to the work of as many counties in Ontario as specialists, representing the Ontario Department of Agriculture. This work has met with unbounded success. Short courses have been inaugurated; special institutes have been held; experimental plots have been grown; articles have been written for the agricultural and local press; farmers' clubs have been formed; and other agricultural activities have been entered into with zest and enthusiasm.

In June of this year two other counties were provided with specialists, Mr. J. H. Hare, B.S.A., going to Ontario county and being located at Whitby, and Mr. R. M. Winslow, B.S.A., to Prince Edward county, and located at Picton.

During the year I inspected the six original schools, my report being published by the Department of Education.

STUDENTS OF THE YEAR.

Attendance.

General Course	404	
Specialists in General Course Work	13	
Manual Training	18	
Dairy Courses	42	
Short Courses in Stock and Seed Judging	328	
Short Course in Poultry Raising	19	
Short Course in Horticulture	78	
		902

At Macdonald Institute.

Domestic Science	274	
Nature Study and Elementary Agriculture	49	
		323
Total		1,225

There were also 140 children from the Guelph Public Schools who received instruction in Domestic Science at Macdonald Institute.

Analysis of College Roll (General Course), 1908.

From Ontario.

Algoma	1	Nipissing	1
Brant	11	Norfolk	3
Bruce	4	Northumberland	4
Carleton	5	Ontario	10
Dufferin	1	Oxford	14
Dundas	4	Parry Sound	1
Elgin	3	Peel	3
Essex	4	Perth	5
Frontenac	3	Peterboro	3
Glengarry	1	Prescott	1
Grenville	5	Prince Edward	1
Grey	7	Rainy River	2
Haldimand	8	Renfrew	1
Halton	10	Russell	3
Hastings	8	Simcoe	9
Huron	5	Stormont	1
Kent	3	Victoria	4
Lambton	7	Waterloo	12
Lanark	3	Welland	6
Leeds	1	Wellington	25
Lennox	2	Wentworth	11
Lincoln	7	York	27
Middlesex	11		
Muskoka	3	Total for Ontario	264

From other Provinces of the Dominion.

Alberta	3	P. E. Island	2
British Columbia	16	Quebec	5
Manitoba	3	Saskatchewan	8
New Brunswick	3		
Nova Scotia	11	Total for other Provinces	51

From other Countries.

Argentine Republic	4	Jamaica	4
Belgium	1	Mexico	1
Cape Breton	1	New Zealand	2
East Indies	1	Scotland	8
England	21	South Africa	8
Germany	1	Spain	4
Holland	1	U. S. A.	22
Ireland	3	Wales	2
India	2		
Japan	3	Total for other Countries	89

Ages and Religious Denominations.

The limits of age of students in the General Course, 1908, ranged from 16 to 39 years. The average age was 20.

Presbyterian	124	Friends	3
Methodist	103	United Brethren	3
Episcopalian	87	Hinduism	2
Baptist	34	Mennonite	2
Roman Catholic	20	Quaker	2
Congregational	7	Unitarian	2
Christadelphian	4	Disciple	1
No Religion	4	Evang. Assoc.	1
Dutch Reform	3		

Bachelors of the Science of Agriculture, 1908.

Archibald, E. S., Wolfville, N.S.
Arkell, T. Reg., Arkell, Ont.
Barnet, W. A., Living Springs, Ont.
Bowes, L. A., Strathnairn, Ont.
Brown, W. A., Meaford, Ont.
Caesar, L., Mono Road, Ont.
Clowes, F. A., Toronto, Ont.
Curran, G. B., Orillia, Ont.
Denniss, F. H., London, Ont.
Frier, G. M., Shediac, N. B.
Gilmour, J. D., Doe Lake, Ont.
Groh, H., Preston, Ont.
Hare, J. H., Cobourg, Ont.
Hibberd, G., New Windsor, Md.
Hodson, R. W., Toronto, Ont.
Johnson, D. M., London, Ont.
Jones, D. H., Guelph, Ont.
Jull, M. A., Burford, Ont.
Lewis, E., Westbrook Mills, N. S.
MacKenzie, D. A., Queenhill, Ont.
McLennan, A. H., Trafalgar, Ont.
Metcalf, I. F., Burford, Ont.
Murray, Chas., Avening, Ont.
Owen, W. C., Thornton, Ont.
Patch, A. M. W., Torquay, Eng.
Slater, A. E., Lunbridge, Wales.
Rose, D. M., London, Eng.
Warren, F., Gamebridge, Ont.
Winslow, R. M., Chelsea Green, Ont.
Wolverton, H. A., Nelson, B. C.

Recipients of Associate Diploma, 1908.

Aldwinckle, E. H., London, Eng.
Armstrong, P. P., Jermyn, Ont.
Arnold, J. H., Eastons Corners, Ont.
Augustine, H. W., Burnaby, Ont.
Ballantyne, N. M., Stratford, Ont.
Beaupre, F. C., Simcoe, Ont.
Bowes, L. A., Strathnairn, Ont.
Bowman, W., Georgetown, Ont.
R. N. Bray, Nashville, Ont.
Brown, E. N., Pineville, Penn., U. S. A.
Campbell, J. A., Lawrence Station, Ont.
Campbell, A. D., Strathroy, Ont.
Canby, F., Burnaby, Ont.
Christie, H. R., Amherst, N. S.
Collins, G. W., O. A. C. Guelph, Ont.
Faulds, T. B., Marmora, Ont.
Ferguson, Chas., Eversley, Ont.
Foster, K. A., Abernethy, Sask.
Foster, N., Toronto, Ont.
Fraser, Roy, Galetta, Ont.
French, P. E., Vernon, B. C.
Guillet, H. J., Mille Roches, Ont.
Haight, W. L., Conway, Ont.
Hibberd, G., New Windsor, Md.
Johnson, D. M., London, Ont.
Kennedy, S., Applehill, Ont.
Kerr, Wm., Bronson, Ont.
King, J. H., Smiths Creek, N. B.
Kitchen, E., St. George, Ont.
Knauss, H. L., Detroit, Mich.
Knopf, A. E., Montreal, Que.
Lawson, E. V., Dunlop, Ont.
LeLacheur, G., Murray Harb. S., P.E.I.
Learmonth, C., Galetta, Ont.
Lewis, J. M., Knoxville, Ill., U. S. A.
Lloyd-Jones, J. G., Llandinan, Wales.
Middleton, W. A., Vernon, B. C.
Moorhouse, R. L., Cairo, Ont.
Neville, S. J., Cottonwood, Sask.
Newhall, H. W., Toledo, Ohio, U. S. A.
Packard, R. C., Brockton, Mass., U. S. A.
Petrie, C. M., Guelph, Ont.
Pritchard, T. W., Redgrave, Ont.
Reek, W. R., Romney, Ont.
Revell, H. K., Walkerville, Ont.
Robertson, C. L., Rancho de Miraflores, Mexico.
Robertson, W. H., Barrington Passage, N. S.
Robinson, E., Guelph, Ont.
Shaw, A. M., Niagara Falls South Ont.
Slater, J. A., Galt, Ont.
Smith, A. S., Chesterville, Ont.
Snyder, A. S., Blair, Ont.
Todd, S. E., Jordan Harbour, Ont.
Tothill, J. D., Bungay, Eng.
Turney, A. G., Saventhen, Belgium
Walker, R. A., Caledonia, Ont.
Wearne, H., Rixheim, Germany.
Whetham, C. A., Kirkwall, Ont.
White, O. C., Ashburn, Ont.
Wilson, S., Rolling Dam, N. B.
Young, W. H., Mirvin, Sask.

First Class Men.

The work of the College is divided into departments, and all candidates who obtain an aggregate of seventy-five per cent. of the marks allotted to the subjects in any department, are ranked as first class men in that department. The following list contains the names of those who gained a first class rank in the different departments, at the examinations held in April, 1908, arranged alphabetically:

First Year.

Baker, A. C., in three departments, English and Mathematics; Chemistry and Physics; Biology.
Bradt, E., in one department, Biology.
Clement, F. M., in three departments, English and Mathematics; Chemistry and Physics; Biology.
Coglon, R. B., in one department, Chemistry and Physics.
Cohoe, D. P., in two departments, English and Mathematics; Biology.
Emmerson, W. W., in one department, Chemistry and Physics.
Ewing, A. A., in one department, Biology.
Fisher, P. A., in one department, Biology.
Gandier, S. H., in three departments, English and Mathematics; Chemistry and Physics; Biology.
Howard, C. F., in one department, Chemistry and Physics.
King, V., in one department, Biology.
Martindale, F. R., in one department, Chemistry and Physics.
Strong, W. J., in three departments, English and Mathematics; Chemistry and Physics; Biology.
Toole, A. A., in two departments, Chemistry and Physics; Biology.
Toole, W., in one department, Biology.

Second Year.

Aldwinckle, E. H., in three departments, English; Chemistry and Physics; Agriculture.
Christie, H. R., in one department, English.
LeLacheur, G., in four departments, English; Chemistry and Physics; Biology; Agriculture.
Reek, W. R., in one department, Chemistry and Physics.
Wilson, S., in one department, Chemistry and Physics.

Scholarships.

Scholarships of $20 each in money were awarded for groups of subjects in first year work as follows: Highest standing with a minimum of forty per cent. of the marks for each subject, and an aggregate of seventy-five per cent. of the total number of marks allotted to the subjects in the group:
English and Mathematics, W. J. Strong, Hatfield, Essex, Eng.
Chemistry and Physics, S. H. Gandier, Lion's Head, Ont.
Biology, A. C. Baker, London, Ont.

The George Chapman Scholarship.

A prize of $20 in books awarded on the work in English of the first two years. The three divisions of the work under the English Department are taken into consideration in awarding the prize, namely, English Literature, English Composition, and Public Speaking. Winner in 1908: E. H. Aldwinckle, London, England.

Prizes.

Three prizes of the value of $10 each in books, were awarded as follows:
One to the second year student who composed and read before a committee the best essay on the subject assigned for the year, viz., "Reading in the Farm Home." Winner: Mr. G. LeLacheur, Murray Harbour South, P.E.I.
One to the student who stood first in general proficiency on first and second year work—Theory and practice,—G. LeLacheur.

One to the student who ranked highest in general proficiency and obtained first-class honors in his major subjects in the fourth year. Winner: Mr. D. H. Jones, O.A.C., Guelph, Ont.

In February last the Louden Machinery Company of Guelph generously offered a cash prize of $20 for the best drawn plan of a barn. The competition was open to students of the second year, and the only stipulation was that the plan should not be large or elaborate, but that the accommodation should be sufficient for about twenty cattle and six horses.

This prize was divided between Messrs. W. R. Reek and A. A. Snyder, each receiving $10.

Medals.

Governor-General's Silver Medal: First in General Proficiency, First and Second Year work, 1907-1908. Winner: G. LeLacheur, Murray Harbour South, P.E.I.

Barton-Hamer Gold Medal: Awarded to that member of the O.A.C. International Live Stock Judging Team, securing the highest number of marks in the Student's Judging Contest, held annually at Chicago. Winner: R. W. Hodson, Toronto, Ont.

The 1905 Gold Medal: Awarded to the member of the Senior Year who, during his course, has done the most for the College, for his fellow-student, and for himself. Winner: R. M. Winslow, Chelsea Green, Ont.

Cash Prizes Won at Guelph Winter Fair.

On Friday, December 11, at the Guelph Winter Fair, a judging competition in Live Stock was held for young men twenty-five years of age and under. The competitions were in charge of Prof. G. E. Day, W. W. Ballantyne, Robert Miller, and J. E. Brethour. Sixty per cent. of the points was given for placing forty per cent. for reasons. The O.A.C. students who won in the various classes are as follows:—Beef Cattle: First, R. J. Allan; second, S. Kennedy; third, W. N. Campbell; fourth, A. D. Campbell; fifth, M. S. Middleton; sixth, A. McMillan; seventh, R. G. Thomson; eighth, A. M. Shaw; ninth, A. McTaggart; tenth, W. R. Reek.

Dairy Cattle: First, R. B. Coglon; second, R. Schuyler; third, C. M. Learmonth; fourth, G. S. Dunkin; fifth, A. McTaggart; sixth, S. H. Culp; seventh, C. Rebsch; eighth, M. M. Baldwin; ninth, C. L. S. Palmer; tenth, R. H. Pilsworth.

Sheep: First, Outsider; second, S. Kennedy; third, W. H. Irvine, fourth, J. F. Harries; fifth, J. E. Rettie; sixth, C. Main; seventh, R. G. Thomson; eighth, Outsider; ninth, J. C. Young; tenth, Outsider.

Swine: First, J. S. Howell; second, W. H. Irvine; third, M. McArthur; fourth, Outsider; fifth, W. G. Orvis; sixth, F. Forsyth; seventh, W. Toole; eighth, A. J. Cowie; ninth, R. R. Moore; tenth, M. M. Baldwin.

Financial Statement.

I append the Financial Statement prepared by Mr. S. Springer, Bursar.

I have the honour to be,

Your obedient servant,

Guelph, December 31, 1908. G. C. CREELMAN.

FINANCIAL STATEMENT, 1908.

COLLEGE DEPARTMENT.

Expenditure.

Salaries and wages	$57,626 27
Servants' paylist (including laundryman)	3,201 74
Meat, bread, groceries, laundry, engine room supplies and fuel	30,768 71
Advertising, printing, postage and stationery	3,788 83
Maintenance, five laboratories	3,915 41
Expenses, Short Courses	1,188 35
Temporary assistance	522 39
Student labor	4,504 87
Travelling expenses and extra lectures	1,999 97
Library	1,606 23
Scholarships	80 00
Telephone service, rents, etc.	395 50
Furnishings and repairs	3,942 81
Sewage	496 80
Contingencies	1,246 92
Services and expenses of temporary assistants in connection with Farm Drainage Demonstrations	999 97
Total Expenditure	$116,284 77
Less Revenue	28,567 64
Net Expenditure	$87,717 13

Revenue.

Board	$20,022 65
Tuition and laboratory fees	7,323 00
Supplemental examinations	99 00
Chemical analyses	203 92
Rent of cottages	240 00
Rent of rooms	130 90
Rent of Post Office boxes	40 25
Fines and breakages	463 69
Sundries	44 23
Total Revenue	$28,567 64

Student Labor, 1908.

Total per Month.		*To Different Departments.*	
January	$570 44	College Department	$278 30
February	461 26	Macdonald Institute	31 78
March	393 26	Chemical Laboratory	96 58
April	108 20	Bacteriological	32 44
May	205 12	Entomological	125 48
June	372 91	Physical	74 50
July	265 48	Botanical	109 08
August	279 15	Library	19 06
September	465 45	Nature Study	24 18
October	673 27	Farm Department	1,103 25
November and December	710 33	Experimental	985 09
		Poultry	464 47
		Horticultural	666 46
		Dairy Department	31 69
		Mechanical	462 51
	$4,504 87		$4,504 87

MACDONALD INSTITUTE AND HALL.

Expenditure.

Salaries and wages	$15,040 00
Servants' pay list	1,793 82
Bread, meat, groceries, furnishings, repairs, engine room supplies and fuel, and labor on grounds	12,805 52
Maintenance of laboratories in Institute	2,886 81
Library and stationery	790 47
Total Expenditure	$33,316 62
Less Revenue	18,548 13
Net Expenditure	$14,768 49

Revenue.

Board	$13,132 75
Tuition and laboratory fees	5,239 50
Supplemental examinations	10 00
Fines and breakages	139 23
Sale of supplies to Nature Study students	26 65
Total Revenue	$18,548 13

FARM DEPARTMENT.

Expenditure.

Permanent improvements	$ 490 00
Wages of men, foreman and stenographer	6,455 16
Purchase of live stock	5,806 22
Maintenance of stock	2,915 99
Farm maintenance (including repairs, blacksmithing, binder twine, seed, furnishings, fuel, light, advertising, printing, stationery, tools, implements, etc.)	2,392 26
Contingencies	296 90
Total Expenditure	$18,356 53
Less Revenue	6,017 95
Net Expenditure	$12,338 58

N.B.—Nothing allowed the Farm Department for the feed, etc., of the department horses, and supplies for the College and Macdonald Hall, including milk.

Revenue.

Sale of cattle:—		
24 steers, 31,477 lbs., at from $5.25 to $8.00	$1,824 98	
1 steer for	40 00	
5 cows for	210 00	
1 heifer for	30 00	
3 bulls for	285 00	
11 calves for	310 50	
		$2,700 48
Sale of pigs:—		
166 hogs at from $5.00 to $6.60	$1,973 55	
4 sows for	82 85	
		2,056 40
Sale of sheep:—		
2 rams at $15	$30 00	
3 ewes at $6	18 00	
1 lamb	5 50	
		53 50

REVENUE.—*Continued.*

Service of animals		65 00
Sale of wool, 414 lbs. at from 7c. to 9c.		37 16
" 3 old wagons for		9 00
" 1 bag potatoes for		1 50
" 1 calf skin, 50c.; 1 sheep skin, 90c.		1 40
" 87 bags at 25c.		21 75
Sale of grain:—		
5 bush. wheat at $1.25	$ 6 25	
205½ bush. barley at 85c.	174 68	
24 bush oats at 55c.	13 20	
		194 13
Sale of milk:—		
8,450 qts. milk at 4c.	$338 00	
4,346.88 lbs. fat at from 10.5c. to 33.33c.	539 63	
		877 63
Total Revenue		$6,017 95

EXPERIMENTAL DEPARTMENT.

EXPENDITURE.

Permanent improvements	$ 498 98
Assistant, specialist in plant breeding, stenographer, foreman, teamsters and laborers	8,328 23
Seeds, manure and special fertilizers	596 97
Furnishings, implements, repairs (blacksmithing, etc.)	632 66
Printing, postage, stationery, contingencies, etc.	315 29
Total Expenditure	$10,372 13

DAIRY DEPARTMENT.

EXPENDITURE.

Permanent improvements	$ 109 72
Wages, including foreman, cheesemaker, buttermaker, engineer, stenographer and bookkeeper	2,446 00
Hauling and manufacturing milk into butter and cheese	1,890 97
Furniture, furnishings, repairs, etc., laboratory expenses, gas, chemicals, etc., and contingencies	769 68
Fuel and light	380 17
Assistant official tester of dairy cattle	437 50
Total Expenditure	$6,034 04
Less Revenue	3,950 51
Net Expenditure	$2,083 53

REVENUE.

Sale of butter, 3,133 lbs. at from 20c. to 35c.		$991 02
" cheese, 562½ lbs. at from 5c. to 13c.		57 52
" cream, 717½ qts. at from 20c. to 40c.		163 50
" fat, 147.84 lbs. at from 11.2 to 31.6		36 62
" skim-milk, 5,909 lbs. at 15c.		8 86
" buttermilk, 117,900 lbs. at from 10c. to 25c. cwt.		121 35
" whey		25 76
" sundries		3 20
Refund of express charges		1 85
Rent of house		120 00
Manufacturing butter:—		
8,657.29 lbs. at 3c.	$ 259 72	
48,633.59 lbs. at 4c.	1,945 35	
		2,205 07
Manufacturing cheese:—		
2,603.51 lbs. at 1c.	$26 03	
12,649.52 lbs. at 1½c.	189 73	
		215 76
Total Revenue		$3,950 51

DAIRY SCHOOL.

Expenditure.

Permanent improvements, cement floors, walks, etc.	$ 169 57
Wages of instructors, engineer, janitor, stenographer and bookkeeper	1,900 00
Cleaning, painting, repairs and contingencies	169 80
Dairy appliances, separators, vats, expense cheese and butter judges, inspecting factories, etc.	465 65
Advertising, printing, stationery, postage, books, papers, etc.	150 91
Fuel and light	188 16
Purchase of milk for use in school	5,203 46
Total Expenditure	$8,247 55
Less Revenue	5,555 55
Net Expenditure	$2,692 00

Revenue.

Fees	$62 00
Breakages	4 05
Sale of butter, 12,960 lbs at from 20c. to 35c.	4,145 73
" cheese, 9,047½ lbs. at from 6c. to 15c.	1,147 67
" cream, 690 qts. at from 20c. to 40c.	155 85
" buttermilk, 3,500 lbs. at 25c. cwt.	8 75
" whey	20 00
" sundries, milk tests, $1.50; two old churns $10.00	11 50
Total Revenue	$5,555 55

POULTRY DEPARTMENT.

Expenditure.

Wages of assistant, stenographer and temporary assistance	$ 856 50
Furnishings and repairs	1,079 88
Permanent improvements	100 00
Purchase of stock	192 10
Fuel, light and contingencies	320 02
Experiments with incubator, fattening and feed	2,321 35
Total Expenditure	$4,869 85
Less Revenue	1,628 30
Net Expenditure	$3,241 55

Revenue.

Sale of eggs for hatching:—		
130⅓ settings at from 75c. to $3.00	$163 00	
1,914 eggs at 5c.	95 70	
		$258 70
Sale of eggs for domestic use:—		
1,963 1-12 doz. at from 10c. to 40c.		437 94
Sale of live poultry, 183 birds, at from $1.00 to $10.00		254 00
Sale of dressed poultry:—		
3,899 15-16 lbs. at from 8c. to 18c.	$467 07	
7 chickens at 50c.	3 50	
162 broilers at from 35c. to 75c.	77 50	
204 ducks at from 50c. to 60c.	110 59	
60 squabs at 25c.	15 00	
		673 66
Sale of 16 lbs. duck feathers at 25c.		4 00
Total Revenue		$1,628 30

HORTICULTURAL DEPARTMENT.

Expenditure.

Permanent improvements	$398 79
Head gardener and foreman, assistant in plant breeding, assistant and night firemen, teamsters, assistant gardener, stenographer and laborers	6,167 82
Manure, trees, plants, bulbs, seeds, cold storage, experiments, implements, tools, furnishings, repairs and contingencies	1,602 98
Fuel and light	914 54
Wax fruit models	502 75
Total Expenditure	$9,586 88
Less Revenue	38 18
Net Expenditure	$9,548 70

Note:—Products supplied to College except when more than required.

Revenue.

Sale of parsley	$ 9 27
Sale of onions	21 37
Sale of cucumbers	5 54
Sale of 1 load wood	2 00
Total Revenue	$38 18

MECHANICAL DEPARTMENT.

Expenditure.

Salary of foreman	$800 00
Tools, fuel and light	199 11
Total Expenditure	$999 11

FORESTRY DEPARTMENT.

Expenditure.

Expenses in Forestry	$9,496 26

SUMMARY, 1908.

	Expenditure.	Revenue.	Net Expenditure.
College Department	$116,284 77	$28,567 64	$87,717 13
Macdonald Institute and Hall Department	3,316 62	18,548 13	14,768 49
Farm Department	18,356 53	6,017 95	12,338 58
Experimental Department	10,372 13	.....	10,372 13
Dairy Department	6,034 04	3,950 51	2,083 53
Dairy School Department	8,247 55	5,555 55	2,692 00
Poultry Department	4,869 85	1,628 30	3,241 55
Horticultural Department	9,586 88	38 18	9,548 70
Mechanical Department	999 11	.....	999 11
Forestry Department	9,496 26	.....	9,496 26
Totals	$217,563 74	$64,306 26	$153,257 48

S. Springer,
Bursar and Superintendent.

PART II.

THE PROFESSOR OF ENGLISH.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith my fourteenth annual report in the department of English.

At present the courses remain much as they were, and I have only to report, in a general way, continued progress in the classes through all the branches of instruction in the department.

Of the branches of instruction in this department,—English Literature, Composition, and Public Speaking,—the two former are receiving their due share of attention. As is inevitable with three distinct branches, the greatest attention has been paid to that branch which offers the least resistance or the greatest attraction. The study of literature is the most attractive of the three; it can be carried on almost as effectively with a large class as with a small one, and as it makes less positive demand on the time of the student, it suits better with a crowded programme of studies. In such conditions, the study of literature is not likely to suffer comparatively, nor have I been disposed to slight it, for its cultural and inspirational value is high.

Composition has not fared quite so well, though it has been by no means neglected. Every sensible student realizes the value to him of being able to write well, but the practice of composition merely for the sake of writing a composition is often irksome, and the duty liable to be evaded. Then as the numbers in the classes increase, the task laid upon the instructors increases proportionately, and from this cause a further limit is imposed upon the amount of work possible in composition. For this year the freshman classes in composition are taught by Mr. Frier, Dean of Residence, and the Sophomore and Junior Classes by Mr. Le Drew, Lecturer in Economics. Neither of these men can give undivided attention to English Composition. Yet the work of this branch is not at present suffering, and there has been marked improvement in the compositions of these classes, both in style and thought. I wish here to commend the painstaking ability of both Mr. Frier and Mr. Le Drew in conducting their respective classes so effectively.

It is in the third branch that the chief lack is felt. To effect results worth while, public-speaking classes should be held continuously and frequently, in the Sophomore and Junior years at least, under a competent instructor who is sufficiently free from other work to give the proper attention to instruction and criticism. So much do the students, the senior students especially, feel the need of further practice and instruction in this branch, that they have attempted, twice within my knowledge, to make private contracts with instructors from the outside. It may be asked,—what do they expect to gain by any such instruction? In the main, it may be said that they seek, not to become elocutionists, or orators, but they seek to become, as far as in them lies, good extempore speakers.

Last September, it was my privilege to visit the Iowa State College at Ames, Iowa. While there, I made special inquiry into the organization of their English department, so far as it concerns the students of the Agricultural Faculty. I found these three departments separately organized: a department of Literature and Rhetoric, with a professor, an assistant pro-

fessor, and a number of assistants; a department of Public Speaking, with a professor and two assistants; and a department of Agricultural Journalism, with one lecturer. I attended a number of their classes to study methods of teaching, particularly in Public Speaking; and besides having conferences with the present professor and instructors, I was enabled to meet the recent head of the department of Public Speaking, Professor Newens, who had lately been appointed as critic of the Lyceum in Chicago.

Allow me to quote a paragraph from the Iowa State College Calendar for 1908-09. This will show what is being done elsewhere in this direction, and also will set forth what we aim to do here:

"The courses in Extempore Speech are designed to give students practical training in speaking without notes or without having written and committed to memory a formal address. There is a great demand for men who are well versed in the sciences and industries as offered in the several departments of the College, to address institutes, conventions, clubs, and commissions on topics related to their chosen work. At gatherings formal and informal that person is in demand who can say the right thing at the right time and in the right way. It is a worthy accomplishment to be able to speak well upon any occasion. For all such, these courses aim to prepare the student. They are in every way practical. The student from the very first is called to the floor to address his class on assigned topics. He is given from three days to a week to gather his material and get it ready for his appearance before the class. As often as once a week each individual is on the floor, oftener if possible. He is subjected to criticisms by the class and the instructor. Criticisms are offered on the prescribed lines of general appearance, force of address, arrangement of material, use of words, vocabulary, etc., etc. By subjecting himself to this severe scrutiny, and by the frequency of his addresses, the student gains an acquaintance with himself and a habit of thinking on his feet, which is real experience in speech-making, second only to that which he would gain in appearing before outside audiences."

I strongly urge that an instructor be appointed, competent to take charge of the Public Speaking classes, and to assist in the other branches of the English department.

The additions in English to the Library have been, as heretofore, both liberal and well chosen. I am pleased to report that, so far as I can judge from the evidences in class, the students seem to be making good use of the Library.

Respectfully submitted,

J. B. REYNOLDS.

PART III.

THE PROFESSOR OF ENTOMOLOGY AND ZOOLOGY.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to present my third annual report on the work of the department of Entomology and Zoology. My colleague, Mr. Tennyson D. Jarvis, and I carried out the prescribed lecture course during the winter term of this year. In the month of June last Mr. Lawson Caesar was appointed as an additional assistant in this department, with the special duties of investigating insect injuries and fungus diseases of fruit trees and other plants. During the current term he has taken a share in the educational work of superintending one of the divisions of the second year and the whole of the third year in their practical work. To the latter he has also given lectures on Economic Entomology, and has assisted Mr. Jarvis with the fourth year specialists in Histology.

At the final examinations conducted by the University of Toronto for the degree of B. S. A. in May last, all the fourth year students who were under instruction in this department were successful, five having taken the Biological option and three the Horticultural. Of these Mr. H. Groh has received the appointment of assistant Entomologist and Botanist at the Central Experimental Farm, Ottawa; Mr. L. Caesar, as already mentioned, a position in this department, Mr. J. D. Gilmour, assistant in the Department of Forestry at Ottawa; Mr. R. M. Winslow, teacher of Agriculture in the High School at Picton; Mr. A. M. W. Patch is continuing his studies in practical Forestry.

In the present Fourth Year there are five students taking the Biological option and eight the Horticultural. Of the former Mr. W. R. Thompson was employed during the summer by the Gypsy and Brown-tail Moth Commission in the State of Massachusetts as an assistant in the work connected with the importation and breeding of Parasites; Mr. R. C. Treherne held a somewhat similar position in the Cotton-Boll-weevil investigations in Louisiana, while Mr. A. Eastham was employed in rearranging and labelling the biological collections in the College Museum; Mr. A. C. Baker, now in his second year, spent the summer in charge of the Insectary work at the Agricultural Experiment Station, St. Anthony Park, Minn. These appointments which afforded the students exceptional advantages for the continuation of their special studies, were all obtained through the influence of this department.

The present fourth year students, who are taking the Biological option, are undertaking special scientific investigations in connection with the theses that they are required to present at the close of next term. Mr. E. W. Stafford is studying the life histories of the Pomace-flies (Drosophilidæ); Mr. R. W. Thompson, the Bird Mites (Analgesidæ); Mr. R. C. Treherne, the life-history and economic importance of the Sorghum Midge; Mr. A. Eastham, the Parasites of Scale-insects (Coccidæ).

During the month of July a share was taken in the instruction of the Summer School of Ontario and other Teachers; this consisted in lectures in elementary and practical Entomology which were given both out-of-doors

and in the lecture room, and field excursions for collecting insects and plants and observing birds and other living creatures. The keen interest taken by the members of the class in what was to most of them a new and unknown field for observation and study was very delightful to witness and made it a pleasure to do what one could to assist and instruct them.

Lectures were also given on economic and general Entomology to the Biological Section of the Canadian Institute, Toronto (Jan. 27); the Hamilton Horticultural Society (April 28); the Victoria County Teachers' Association (June 5); and at Erindale, County of Peel (Nov. 17). Mr. Jarvis gave two lectures on "Insect and Fungus Diseases" to the Short Course in Horticulture, and one on "Poultry Parasites" to the Short Course in Poultry in January last; in February he gave two lectures at Stoney Creek to the members of the Fruit Institute on "Birds in Relation to Horticulture," and the "Insect and Fungus Pests of Fruit"; at Waterdown a lecture on "Insects and Diseases affecting Vegetables and Fruits" (March 10); and at Toronto before the Vegetable Growers' Convention an address on "Combatting Insect and Fungus Foes of Vegetables" (Nov. 12). Mr. Caesar gave two addresses to the Farmers' Institute meeting at Picton (Nov. 16 and 17) on the "Fungus Diseases of Fruits."

Publications.

In addition to editing the monthly issues of the "Canadian Entomologist" and the annual report to the Legislature of the Entomological Society of Ontario I have contributed a number of short articles in answer to enquiries in the Farmers' Advocate and other agricultural journals, and also an article on the "Injurious Insects of 1908 in Ontario" to the annual report of the Entomological Society. In the Transactions of the Royal Society of Canada has been published my eighth annual "Bibliography of Canadian Entomology."

Mr. Jarvis has edited the "Ontario Natural Science Bulletin: The Journal of the Wellington Field Naturalists' Club" for 1908; and contributed the following articles: "The Gall Insects of Ontario," "Some additional Scale Insects of Ontario," and "Apparatus for collecting small aquatic and terrestrial Arthropods," annual report of the Entomological Society; "The Rodents of Ontario"—Ontario Natural Science Bulletin, and a number of short articles in the "Canadian Horticulturist."

Mr. Caesar has issued Press Bulletins which have been published in a large number of the newspapers of Ontario on "The Shot-hole Borer or Fruit-bark Beetle," "The Hessian Fly," "Brown-rot the cause of gum exudations on Peach-trees," and "Cankers on Apple-trees."

Correspondence.

A considerable portion of our time, especially during the summer months, is taken up with correspondence; enquiries come in from all parts of the country every day asking for information regarding a great variety of insects. In the early part of the season examples of the Oyster-shell Bark-louse and other Scale insects were received from at least twenty different counties, the senders in many cases fearing that they were afflicted with the dreaded San José scale. A scale which has seldom been observed in Canada was found this year in large numbers on an elm tree in Toronto; it was identified as *Gossyparia ulmi*, an imported European species which is becoming widespread in North America.

Among forest and shade tree injuries may be mentioned the defoliation of Spruce trees at Whitby by the caterpillars of the Fir Saw-fly (*Lophyrus abietis*); the destruction of an enormous number of Tamaracs on the north shore of Lake Superior by the Larch Saw-fly (*Nematus Erichsonii*), which has gradually been spreading from the Province of Quebec till it has now reached the country west of Fort William, killing the larches wherever it goes. The Spruce Gall-louse continues abundant, especially affecting young trees; the Tussock Moth, which can easily be kept within due bounds by destroying the egg-masses in winter, has been allowed to remain unchecked and to defoliate the shade trees in several cities and towns. Maples have been attacked in several places by the boring grubs of the Pigeon Tremex, and the foliage rendered unsightly by Eriophyes galls. Some basswood trees in Toronto and elsewhere have been much injured by the galleries excavated in the wood by the large black Carpenter Ant.

Numerous complaints have been received regarding domestic insects, such as Buffalo-beetles, Clothes-moths, Bed-bugs, Cockroaches, and Ants, which cause so much annoyance and loss to careful house-keepers. It is hoped that the information afforded by the Department has served in many cases to allay anxiety and to bring about relief from the obnoxious insects. One rather unusual occurrence was the finding of numbers of the so-called Silver-fish (*Lepisma*) in a house at Mt. Salem; this small insect is covered with shining silvery scales like those of a fish, hence its name—and feeds upon starchy substances, occasionally being injurious to the binding of books as well as clothing.

Farm crops as a rule have been little affected this year. The Hessian fly was reported from a few counties, and Cut Worms inflicted much damage upon a variety of crops. The chief outbreak was that of Plant-lice (*Aphis*) on Turnips and Cabbage; in the autumn they were present in enormous numbers all over the country and many fields of these plants were rendered almost worthless by the attack. The hot dry weather which prevailed from the middle of August was very favorable to their multiplication. Wire-worms and White-grubs were much complained of. Flea beetles were bad on corn, turnips, beets and potatoes; the Pea-moth caused some damage in the neighborhood of Lindsay, but the Pea-weevil does not seem to have been as widespread as usual. Fumigation with carbon bisulphide is a cheap and easy remedy if the pea growers would only adopt it everywhere. The yield of Clover-seed was much reduced in places by the Clover-seed Midge for this also there is a simple remedy, viz., cutting or pasturing off the first crop before the middle of June and thus getting a full second crop uninjured by the maggots.

Vegetables have suffered from the usual attacks of their special insect foes, but there has been no remarkable outbreak such as that of the Variegated Cut-worm last year. Fruit-tree insects are referred to in another part of this report.

The correspondence we receive is of much value and interest to us, as it brings to our notice many attacks which we should otherwise know nothing about, and at the same time we have reason to believe that we are able to give useful advice and information to those who apply to us.

Fungus Diseases and Insect Pests.

The practical work in fungus diseases and insect pests has fallen very largely to Mr. L. Caesar, who was appointed to our department in June of this year. This line of work has been increasing very rapidly but the pressure of other duties has hitherto prevented its getting as much attention as

it deserved. In addition to identifying whatever diseases or insect pests are sent to him and giving the latest and best known methods of treatment, Mr. Caesar has visited a number of orchards throughout the province at the request of their owners to discover, if possible, the cause of the unhealthy condition of their trees and to advise them in the matter of treatment. For this purpose or in order to investigate diseases on his own part, he has visited during the summer orchards at Grimsby, St. Catharines, Niagara Falls, Niagara-on-the-Lake, London, Simcoe, Leamington, Chatham, Essex, Sandwich, Zenda, Lindsay, Whitby, Oshawa, Belleville and in Prince Edward County. In the last four districts the inspection of orchards was made in company with the local agricultural representatives, Messrs. Hare and Winslow respectively. These trips have been of great benefit, not only to the farmers interested but also to the department. They have helped much to show what diseases and insects at the present time require most attention and have likewise given an opportunity to make collections for class instruction of most of our worst diseases and insects. The specimens thus brought back, together with insects reared in the insectary have furnished material for many "Riker mounts," illustrating our worst fungus diseases and insect pests. These mounts have been found very serviceable not only for teaching purposes but also for fall fairs and demonstrations on other occasions. The orchard inspection work, moreover, when carefully done, is no small factor in bringing the farmers and the College into close touch with mutual benefit.

In addition to this kind of work much time has been devoted to original investigations. One of these was an attempt to discover the cause of the abnormally large number of gum exudations on peach trees last spring in the Niagara district, especially in the neighborhood of St. Catharines, where it was feared that some new and very destructive disease had suddenly appeared.

At the request of the Department of Agriculture Mr. Barlow of the Bacteriological department and Mr. Caesar were sent to the district to investigate. Mr. Barlow soon discovered that the disease was not due to bacteria. Mr. Caesar then continued the investigation to see whether a fungus might be the cause. Specimens of diseased parts were sent to different experts in the United States, and acting on a suggestion received from Mr. A. D. Selby, of Ohio Experiment Station, who expressed the opinion that at least some of the trouble might be due to the Brown Rot (*Sclerotina fructigena*), which attacks the fruit of the peach, cherry and plum, a number of inoculations with this disease were made on young peach trees on June 24th and again on July 1st and 2nd. In some cases the fungus was taken directly from rotting cherries near by and in others from pure culture in wort-gelatin. Check inoculations with a sterilized scalpel were made on each occasion. A few inoculations were also made at the same time with pure cultures from other fungi obtained from diseased spots on the affected trees at St. Catharines. In about a week all the places inoculated with Brown Rot had begun to exude gum freely, and inoculated twigs soon became girdled and broke off with the wind. The checks in all but one case rapidly healed over without any exudation of gum, as did the inoculations with the other kinds of fungi, with the exception of three which produced a slight amount of gum. These, however, did not continue to increase when the grafting wax which had been used to cover them was removed and soon dried up, contrary to the conduct of the Brown Rot inoculations. The gum on the latter was in December still to be seen as a dark hard mass.

An experiment was also made to see whether the disease could enter through the lenticels or breathing places on the healthy bark. The result showed that if the part was kept moist this could happen.

It was not possible on account of scarcity of peach trees at the College and the enforced absence of the investigator on other work to extend these experiments so far as one could have wished this year, but sufficient has been done to show that the Brown Rot could produce the disease, and as old diseased mummy peaches and plums were to be found in the orchards affected, it was natural to suppose that these, whether on the trees or on the ground, were the cause of the trouble. Observations in orchards since the experiments have revealed so many cases of dead twigs and gum exudations intimately associated with Brown Rot on the fruit that there seems practically no doubt that the cause of the abnormally large number of gum exudations can be ascribed to this fungus. The only explanation that we can give at present of why it should have been so much more severe than usual in its attack this spring is that the long continued wet weather in May softened the tissues of the bark and gave the spores ideal conditions for germinating and getting a footing in the trunk and branches either through cracks or lenticels.

It should be remembered that gum exudations in peach trees may be due to wounds of any kind, such as those made by the Shot-hole Borer, Peach tree-borer, or by implements in cultivation. Such causes can, however, easily be recognized by removing the gum, whereas in the above case the work of the fungus is clearly a different thing.

After the experiments had been ended and sufficient observations made in orchards to corroborate the conclusions arrived at, a brief Press Bulletin entitled "Brown Rot a Cause of Gum Exudations on Peach Trees" was prepared and sent to the local press in all the peach growing districts. This article described the appearance of affected trees and suggested remedies. These are all in the nature of prevention rather than cure. The first step is the removal and burning of diseased fruit on or under the trees as soon as possible after the picking season. Plum trees should be looked after as carefully as peach trees. Having seen to the destruction of the diseased fruit, care must be taken to see that the trees are properly sprayed. The first spraying, which should be just before the buds burst, may be either with the ordinary lime-sulphur boiled for one hour or with Bordeaux mixture. As Bordeaux later than this is dangerous to the peach foliage, some other spray mixture should be used.

Experiments at Washington this year have shown that self-boiled lime-sulphur of the strength of 5 lbs. sulphur, 10 lbs. lime, and 40 gals. of water will not injure the foliage and will very largely control both the Brown Rot and the Peach Scab. As high as 10 lbs. sulphur and 15 lbs. lime to 40 gals. of water were used without injury. To make this mixture put the 10 lbs. of fresh stone lime in a barrel and add about two gallons of boiling water, at once put in the 5 lbs. of sulphur and add a little more boiling water. Stir occasionally to prevent burning and when not stirring keep the barrel covered with an old rug or sack to keep in the heat. A minimum amount of water will hasten the cooking process. When the boiling has ceased add enough cold water to make 40 gallons of the mixture. Strain carefully and apply at once, keeping the liquid well agitated all the time to prevent settling. Arsenate of lead or Paris green may be added if desired for the Plum Curculio.

The first application of this mixture should be just after the blossoms fall, and two more applications should be given after this at intervals of two weeks between them.

Another subject which has been receiving much attention from Mr. Caesar is cankers on apple and pear trees. In this investigation Mr. Winslow of Picton and he have worked to a large extent together. On account of the great amount of damage to orchards from cankers, it was found advisable

that Messrs. Winslow and Caesar should at once make a trip to Ithaca and Geneva, where these diseases have probably been studied more carefully than anywhere else in North America. At Cornell University Prof. Whetzel very kindly examined the specimens brought and identified the cause in most cases as Black Rot (*Sphæropsis malorum*) and in a few as Blight (*Bacterium amylovorum*). He also gave many valuable suggestions as to the best methods of treating the disease and showed an orchard in which cankers had been successfully treated by himself.

Since returning from Cornell a great deal more information has been gained not only about the amount of damage being done in different localities but also about the way in which each disease acts upon the trees and the varieties that are most subject to attack. These cankers have been formed to a greater or less extent in almost every orchard from Sandwich to Belleville, but are, as far as has been observed, most abundant and destructive in orchards east of Toronto along the north shore of Lake Ontario, being especially severe in Prince Edward County and the mainland opposite.

On account of the ravages the disease was making and the need of getting the farmers interested so that they might take the necessary measures to prevent further loss to their trees a press bulletin on the subject entitled "Cankers on Apple Trees," was prepared and copies sent to more than 400 newspapers throughout the province. The following is a copy of the bulletin:

Cankers on Apple Trees.

"Many Ontario apple growers have complained that an unusually large number of branches are dying on their older apple trees and not a few of the younger trees have been killed outright. The trouble has usually been attributed to Sun-scald and Oyster-shell Scale. Investigations this autumn, however, have shown that the greater part of such damage can be traced to cankers, caused either by a fungus disease known as Black Rot or a bacterial disease known as Pear Blight, Fire Blight, or Twig Blight. The Black Rot attacks also the leaves and fruit causing the latter to rot. On the surface of the rotten fruit little black pustules or pimples almost one-third the size of a pin-head appear after a time. These pimples contain spores which when set free are carried by the wind from tree to tree and help spread the disease in the summer. Either kind of canker may cause diseased areas on the trunk and large branches or at the main crotch. It is not easy to tell in every case to which disease a canker is due.

"*Blight Canker*, however, often begins by attacking a water-sprout and running down into the trunk, crotch or main branch and forming a large dead area there. At this time of year such areas caused by blight are usually distinctly marked off from the healthy bark by a crack between the two, and by the diseased bark being darker brown in color than the healthy bark and slightly shrunken. As a rule the surface of Blight Cankers is fairly smooth, not rough, checked or blackened and is free from pimples except in old cankers where other diseases have got in and caused them.

"*Black Rot Canker* on the other hand is as a rule not distinctly marked off by a crack between it and the healthy bark. The central part, especially if more than a year old, is often but not always somewhat swollen and the bark is rough, black and checked. On part of the smoother surface there will often be found numerous little black pimples or pustules about one-third the size of the head of a pin. These are the places where spores are produced that spread the disease in the spring of the year.

"Both kinds of cankers may live over from year to year and continue to increase in size. This is especially true of Black Rot Canker, though often this, as well as the other, may die out at the end of the first year. The diseased area may be small in either kind or again it may include the whole of the trunk and part of the branches, or may run for several feet along a single branch. In old trees only the branches are attacked. Black Rot Cankers are often formed on the under side of the branch.

"*Remedies*: Where a tree is too badly attacked to give any hope of its recovery, it should be cut down and burned as soon as possible for otherwise the disease will spread from it even though the tree itself be dead. In the same way dead or dying branches should be cut off and burned either this fall or early next spring, taking particular pains to see that the cut is made several inches below any trace of the diseased area. All cuts thus made should be disinfected in the manner described below and then painted. If this is done the frost will not injure them. Wherever a healthy stub is left after cutting off the cankered part of a branch it can be cut afresh in the spring and grafted.

"Where the cankered areas are not too large, especially on the trunk and crotches, they should be neatly cut out with a knife or some sharp instrument until the healthy bark is reached. The wounds thus made must be disinfected and painted with white lead or paint free from turpentine. The painting should be repeated next spring to make sure that no disease gets into the wounds. The best disinfectant to use is corrosive sublimate of the strength of 1 part by weight to 1,000 parts of water. Any druggist will supply the substance and explain how to make it up. The material will cost only a few cents. A wooden or glass vessel must be used instead of iron or tin as the substance will corrode them. Corrosive sublimate is deadly poison when taken internally, so care must be taken not to allow anything to drink the liquid, and to wash the vessel thoroughly before using it for any other purpose. The best way to disinfect the wound with corrosive sublimate is simply to tie a little sponge or a small pad of cloth on the end of a stick and, after dipping it into the liquid, wash over the surface of the wound. This will kill any kind of germ whatever.

"To ward off cankers for the future it is necessary (1) To prevent as far as possible injury to trees by such means as tearing off the bark by whiffle-trees or other implements or by boots in climbing. If wounds are made in this way, they should be disinfected and painted at once; otherwise they let in germs of the disease. Cankers usually start in wounds of some kind though sometimes these may be very small. Sun-scald injuries also allow Canker germs to enter, hence young trees should be protected against Sun-scald by some one of the well-known devices for this purpose. (2) Water-sprouts should be kept off the trunks and main branches, because, as said above, the Blight disease often runs down one of these and starts the canker below. A few minutes will usually suffice to remove all the water-sprouts from any ordinary tree. (3) The trees must be carefully sprayed with Bordeaux mixture and special pains taken to see that the trunks and main branches are thoroughly covered with the Bordeaux. The first spraying should be done just before the leaf buds burst, the second a few days before the blossoms open, and the third within a week after most of the blossoms have fallen. Four to eight ounces of Paris green should be added to each barrel of Bordeaux and the whole kept well agitated while spraying. The spraying will then not only do a great deal to keep off cankers but will also kill most of the codling moths (which cause the wormy apples), the cigar case-bearers, pistol case-bearers, canker worms, bud moths, and many other insects; and in addition will keep the apples free from scab, so that orchard-

ists should thus get a return for the time and money spent in the form of healthier trees and more and better fruit. Care should be taken in every case to see that the spraying is thoroughly done at the time mentioned. Orchards that are kept properly pruned and sprayed have been found to be very much less affected with canker than those that are neglected."

Mr. Caesar's inspection of orchards has given him an opportunity for making some observations on insect pests as well as fungus diseases.

The following is a brief account of some of the more important things noted:—

In more districts than ever before farmers are using the lime-sulphur wash against the San José scale. Wherever this mixture is properly made and applied it has given excellent results. In some counties and particularly in Kent many farmers have been receiving such low prices for their apples that as soon as they find the scale in their orchards they become discouraged and believing that the cost and trouble of fighting it are greater than the returns they would get, are allowing their orchards to fall a prey to the insect. The great need in such districts seems to be the formation of up-to-date fruit growers' co-operative associations with intelligent, well trained orchardists at their head. Such an organization has been formed at Chatham and has already done good work, though much still remains to be done.

The Oyster-shell Scale, or Apple Bark Louse, especially in the eastern and middle parts of the province, is very abundant and destructive. A vigorous warfare is being carried on against it in various districts and many orchards are now almost free from the insect. The favorite remedies are,—

(1) Whitewash applied twice in the autumn as soon as possible after the leaves have nearly all fallen—strength 1½ lbs. fresh lime to 1 gallon water;

(2) The Lime-sulphur wash applied as late as possible in the spring before the buds burst;

(3) Gillett's Lye applied any time in the spring before the bursting of the buds;

(4) Kerosene emulsion used when the young lice are running, that is about the first week in June.

An interesting and encouraging feature about the insect is that where orchards are carefully sprayed three times a year with Bordeaux mixture for the Apple Scab this treatment alone serves in most cases to control the scale.

The Leaf Blister Mite of the Apple and Pear seems to be spreading pretty rapidly and is now found in numerous districts where a few years ago it was unknown. It can be successfully controlled by means of spring or fall application of either lime-sulphur or of 20 per cent. kerosene emulsion. As the mites winter under the bud scales special pains must be taken to see that these are thoroughly covered by the spray.

The Apple Maggot or Railroad Worm is doing considerable damage in Prince Edward County. It is also found in a few other districts but does not seem to spread rapidly. In spite of the fear of many farmers that this insect cannot be controlled there is very little doubt that if the fallen fruit were destroyed each day the pest would soon be wiped out of an orchard. An instance was found where this method had been followed with the result that the orchard was almost free from the insect this summer though badly affected a few years ago.

The Lesser Apple Worm has been charged with doing much damage in orchards this season, but of all the fruit sent in or examined in the orchards only a very small percentage had been injured by this insect. The Lesser Apple Worm, though not known to many fruit-growers, is not a new insect;

for Dr. James Fletcher recorded its presence in this province several years ago. Its life-history is about the same as that of the Codling Moth and the same remedies are used for both pests. The worm of this insect eats the pulp of the apple beneath the skin and generally leaves a large irregular blotch which greatly disfigures the fruit. The cavity formed usually differs distinctly from that of the Codling Worm, and unlike the latter, very seldom reaches to the core. Many little hemispherical cavities beneath the skin with a small opening through the centre to the exterior are often formed in apples. Some have mistakenly attributed these to the Lesser Apple Worm. They are probably caused by the Plum Curculio when feeding.

The best remedy for this insect, when attacking apples is to cultivate the orchard thoroughly up to July, and thus keep out all weeds and rubbish. Careful pruning also helps; for it has been found that the more sunlight can reach the fallen apples and the less rubbish there is the fewer the curculios are. Of course hogs running in an orchard help greatly, and spraying for the Codling Worm will kill a large number of the curculios also.

The Shot Hole Borer, also known as the Fruit-tree Bark Beetle or Pin Borer, is an insect that threatens to become very destructive in the Niagara district unless the fruit-growers will co-operate and take the simple steps necessary to control it. The insect is a tiny black beetle about 1-12 in. long. It attacks as a rule only dead or dying trees, but when very abundant often attacks perfectly healthy ones, preferring cherry trees in most districts, although not infrequently attacking the plum and peach as well. Wherever it bores through the bark of a healthy tree it causes gum to exude, and often trees are found with thousands of these little gum masses. Its attacks are worst from about the middle of May to the middle of June and again from about the end of the first week in August to the end of September or even later.

The complete control of this insect requires that all the farmers of the district should co-operate in cutting down and *burning* all the dead and dying fruit trees of every kind in their orchards. This should be done sometime between the late fall and early spring when the beetles are still dormant and cannot escape. If only a few farmers follow this course they may not succeed in saving their trees because the beetles often fly for considerable distances from orchard to orchard. Hence the necessity of all working together is quite apparent.

An attempt will be made before spring opens to interest the fruit-growers and get them to take the necessary steps to prevent further destruction of their trees by this borer.

Experiments with Insecticides.

In order to test afresh a number of insecticides, the following experiments were conducted:

(1) On July 20th, Poisoned Bran, made according to Dr. Jas. Fletcher's formula, was used for Cut Worms that were seriously injuring turnips on the College farm. The mixture was applied at twilight and 25 lbs. were used, a quantity sufficient in this case for ⅓ of an acre. The result was remarkably successful and corroborated the claims made by others for this remedy. We can heartily recommend it to farmers and gardeners as an excellent remedy for cut worms.

(2) On July 24 and again on the 27th, experiments were made with fresh Pyrethrum or Insect Powder to test its effect upon Cabbage worms, which have been very abundant this year. This insecticide was used first as a dry

powder, and secondly as a liquid spray in the proportion of 1 oz. of the substance to 2 gals. of water. The application in the first case was made with a dust sprayer, and in the second with a knapsack sprayer. Contrary to expectation the latter method gave more satisfactory results and was also more economical. Every caterpillar touched, *i.e.*, over 80 per cent., was killed. It also killed the chrysalids. The powder cost 40 cents a lb. and 1 oz. at the dates mentioned was sufficient to treat more than 100 plants.

The experiments showed that Pyréthrum was a very satisfactory remedy for Cabbage worms. Its advantage over Paris green lies in the fact that it is not poisonous to man.

The Insectory—from the Vegetable Garden.

(3) At different times during the season experiments were made against several species of aphids or plant lice with kerosene emulsion, whale-oil soap, and simple soapsuds. The object was chiefly to see whether the soap-suds would give as satisfactory results as either of the other washes. It was found in every case tested that there was very little, if any, difference between the efficiency of these three remedies, using kerosene emulsion at the strength of 6⅔ per cent. kerosene, whale-oil soap, 1 lb. to 6 gals. water, and soap-suds, 1 lb. soap to 4 gals. water. The only soaps tested were Sunlight and Royal City. There was practically no difference between these.

When spraying Cabbage Aphids and other mealy species (that is those covered with a waxy secretion) it was observed that the insects were seldom killed if they were merely touched by the spray: to make the treatment effective they had to be drenched.

(4) A test made with the commercial lime-sulphur seemed to indicate pretty clearly that this mixture at the ordinary recommended summer strength would not kill the apple aphis.

Fall Fairs.

In response to the request of the eight Agricultural representatives from this College stationed in different counties of the province, an exhibit composed of the worst fungus diseases, insect pests, noxious weeds and weed seeds was sent to each of the following fall fairs: Lindsay, Perth, Morrisburg, Winchester, Picton, Ameliasburg, Oshawa, Galt, Collingwood and Essex. In addition to this, exhibits were sent to Renfrew, St. Catharines, and Toronto fairs and a very large special exhibit to the Ontario Horticultural Exhibition held in Toronto in November.

Wherever possible either Mr. Jarvis or Mr. Caesar went with the exhibition. In such cases they supplemented the collection by gathering as large and varied a display as time permitted of the diseases and weeds of the district in which the fair was held.

The Insectory—Central Room.

At each place attended numerous questions were asked by the farmers and much interest was taken in learning the names and best methods of treating the diseases, insects or weeds to be found on their respective farms. It was very evident in every case that the farmers were much pleased to have such an exhibit at their fair.

The Insectary.

It has been a source of much gratification to us that we have been able to make considerable use of the series of glass-houses forming the Insectary. Owing to defective construction they have not, however, proved as satisfactory as was to be expected. A large number of insects have been reared during the season and their life-histories more or less fully recorded; many

specimens have also been bred for the permanent collections and class-work, much more perfect examples being obtained in this way than by ordinary field methods. The accompanying illustrations will afford some idea of the building and the methods of work and observation employed.

The Museum. During the summer months the whole of the Biological and Geological cases were rearranged in systematic order and a large number of specimens were properly labelled. The visitor can now inspect the birds for instance in regular sequence of scientific orders; the other classes of animals are not so fully represented, but the examples we have are properly arranged. No additions deserving of special mention have been made during the year.

The Insectory—North-east Room.

I desire, in conclusion, to refer to the valuable assistance that I have received from Mr. Tennyson D. Jarvis throughout the year, whose work in both Entomology and Zoology has been conducted with the utmost zeal and industry, to the great benefit of the students and to the maintenance of the high standard of the department. During the last six months we have had also the assistance of Mr. Lawson Caesar who has taken a share in the class-room work of the term, and has done useful work in the inspection of orchards for fungus diseases and insect injuries. This welcome addition to the staff enables us to cover more fully than we otherwise could the various kinds of work which come within the scope of this department.

Respectfully submitted,

CHARLES J. S. BETHUNE.

PART IV.

THE PROFESSOR OF BOTANY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit my third annual report of the work of the Botanical department.

TEACHING.

There have been no changes in the personnel of our staff during the year. There have been a few changes made in the arrangements for instruction, however. A beneficial change has been made in the handling of the Botany in the First Year. In each disivion of the year we have divided the students into three sections. In the first we take those students who have never attended a High School or had instruction in Botany. In the second section, we take those who have had an equivalent of one year's High School work and only a very elementary introduction to Botany, and in the third section those who have a High School education equivalent to university matriculation. This arrangement makes classes of about twenty or twenty-five students of a somewhat equivalent preparation for each instructor, and it is generally agreed that larger classes for practical work, particularly in commencing the study of a science, are a disadvantage to teacher and pupil alike. In our case, I feel sure, our first year students are getting better grounding in the subject of Botany than they received formerly when we had larger classes. Messrs. Eastham and Howitt have taken over the work in Fungi and Plant Pathology. In preparation for this change Mr. Eastham spent his month's holidays in a special study of Fungi under Professor Atkinson, of Cornell University, and Mr. Howitt spent his holidays with Prof. Whetzel, of the Cornell Agricultural College, in the special study of Plant Diseases. The instruction in Fourth Year Plant Histology, formerly taken by me, has been placed in Mr. Eastham's charge.

EQUIPMENT.

During the year we have added to our equipment: (1) a splendid series of botanical charts by Kny, published by Paul Parey, Berlin, Germany; (2) a number of new pieces of apparatus for the work in plant physiology; (3) seven new microscopes for the use of the third and fourth year students; (4) three dissecting microscopes for the special study of grasses and weed seeds.

With the large increase in the number of students in the senior years, we find need for a larger number of microscopes. We should add at least ten to our supply next year. We find, too, increasing difficulty in accommodating students in the laboratories. There will soon be urgent need for laboratory re-arrangement if the classes increase in size.

Correspondence.

The amount of correspondence concerning fungous diseases, weeds and weed seeds increases year by year. During the winter and spring months numerous samples of clover, grass and grains were tested and reported on. Apparently the farmers and seed dealers of the Province are learning to take advantage of our services in these matters. Reports by Messrs. Eastham and Howitt on Weeds, Fungous Diseases and our Herbarium are included herewith.

Troublesome Weeds of the Year.

Judging from an analysis of the enquiries received during the past year the following weeds have been the most troublesome:

Perennial Sow Thistle (*Sonchus arvensis*), Bladder Campion (*Silene inflata*), Field Mustard (*Brassica sinapistrum*), Ragweed (*Ambrosia artemisiæfolia*), Twitch Grass (*Agropyron repens*), Dodder, (*Cuscuta epithymum*). All these weeds have been fully dealt with in previous annual reports or in bulletins issued by this Department and therefore will not be touched upon here. Two other weeds, however, which have not been previously discussed are worthy of mention, as numerous enquiries have been received concerning them during the past year. They are Crab or Finger Grass (*Panicum sanguinale*), and Small Flowered Cranesbill (*Geranium pusillum*).

Crab or Finger Grass. Many reports have been received that this grass was proving a pernicious pest in lawns. It is a spreading annual grass which lies close to the ground and roots at the lower joints. This prostrate habit of growth makes it almost impossible to cut it with the lawn mower and hence it frequently gets ahead of and crowds out the lawn grasses. This grass is easily recognized by the form of the inflorescence which consists of a number of spikes springing from the top of the culm, like the fingers on a hand, hence the common name Finger Grass.

Small Flowered Cranesbill. This is another plant which was brought to our attention by correspondents several times this year as a lawn weed. Patches of it were also found on several parts of the College campus. Judging by its prostrate habit and the rapidity with which it grows it is likely to prove quite a serious pest to deal with in lawns. It is a low-growing, diffusely branched annual plant with small purplish flowers and orbicular leaves which are deeply cleft into a number of lobes.

Recent Introductions.

Field Pepper Grass or Cow Cress (*Lepidium campestre*). This is a weed which was mentioned in our last annual report as spreading over Ontario as am impurity in Red Clover seed. This year it has been reported from many sections of the Province and in nearly every instance correspondents report finding it in Red Clover. Many of the samples of Red Clover seed examined here during the past year contained the seed of this weed. It is an annual or biennial weed and though it is not likely to prove troublesome on well tilled farms it is by no means a desirable introduction and Red Clover seed should be carefully examined for the seeds of this weed before being sown.

Roquette (*Eruca sativa*). This weed was reported as occurring in Ontario for the first time last year. This year it has been sent in from three different parts of the Province. In every case it has been reported as having been found in Alfalfa and has undoubtedly been distributed as an impurity

in Alfalfa seed. It belongs to the Mustard or Cress family (*Cruciferæ*) and in some parts of Europe is considered a very serious pest. It is therefore very important that every precaution should be taken to prevent it from becoming established in Ontario. This can only be accomplished by a careful inspection of all Alfalfa seed sown and by keeping constant watch on Alfalfa fields in order to destroy any specimens of this weed that may appear before they mature their seed.

Russian Thistle (*Salsola Kali*, var. *tragus*). This weed has been found in waste places in many parts of Ontario for several years, but until this year has not been reported as being found to any extent in cultivated crops. This year, however, it has appeared in Alfalfa fields in many parts of Ontario and caused considerable alarm to those who were not acquainted with it.

The Russian Thistle is a smooth, bushy branched annual from one to three feet high. Mature plants are more or less spherical in form. The stems and branches are red in color. The leaves are awl-shaped, one to two inches long, soft and fleshy when young, very prickly pointed when mature. The flowers are inconspicuous, being small without petals, and solitary in the axils of the leaves. In several of the Western States this weed is a very serious pest. The plants, when ripe, break off near the surface of the ground and are rolled long distances by the wind, scattering their numerous seeds on their journey. It is this tumbling habit that makes this weed particularly adapted to the prairie lands of the West and it probably will never be a pest in Ontario, where fences, trees and other obstructions will prevent its being spread far and wide by the wind.

A New Weed.

Barnaby's Thistle (*Centaurea solstitialis*, L.). This plant, we believe, is almost new to Ontario. Its home is in the Mediterranean region, but it has been introduced into most warm countries with Alfalfa, clover and other seeds. It was first noticed growing in an Alfalfa field on the College farm. Later a sample was sent in by a correspondent who had found it in his Alfalfa field. It is probable, therefore, that it has been introduced as an impurity in Alfalfa seed.

Barnaby's Thistle is a bushy branched annual weed, from one to two feet high. It belongs to the Composite Family (*Compositæ*). The flowers are yellow and the upper bracts of the involucre terminate in stout yellow spines about three-fourths of an inch long. These spines are very conspicuous. The whole head is more or less woolly pubescent. The lower leaves are pinnatifid, the upper linear, entire and decurrent. This plant being an annual and very conspicuous is not likely to become a bad weed.

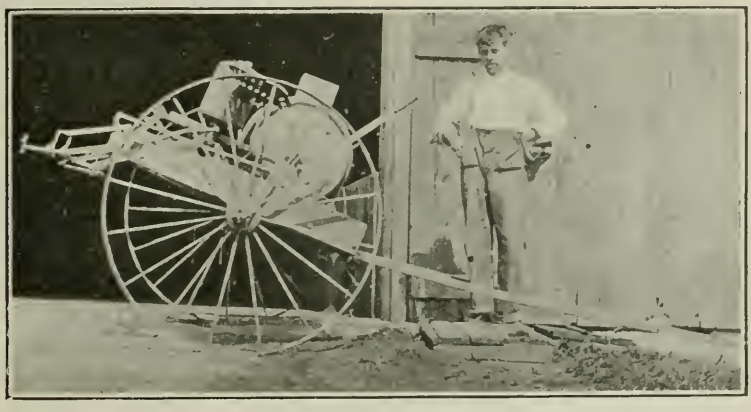
Spraying Experiments.

Some years ago it was successfully demonstrated that Copper Sulphate could be used as a spray to kill mustard in grain crops. In March, 1908, Prof. Bolley, of the North Dakota Experiment Station, published a bulletin in which he gave results of spraying various weeds with Iron Sulphate which would indicate that it might be successfully employed to destroy Bindweed, Canada Thistle, Dandelion and Great Ragweed in growing grain without injury to the crop. In order to gain further information on this subject the Botanical department, during this past summer, carried on several experiments with Iron Sulphate as a spray to kill weeds.

Bindweed, Dandelion, Mustard, Chickweed, Canada Thistle, Burdock, Curled Dock and Annual Sow Thistle were sprayed with a mixture containing 75 pounds of Iron Sulphate to 40 gallons of water. This mixture was

applied with an ordinary spray pump, such as is used to spray fruit trees. Though no definite conclusion can be drawn from the experiments made, the results are indicative of what may be proved by further experiments.

A large patch of Bindweed in the College orchard was sprayed ten times with the Iron Sulphate at intervals varying from three days to two weeks. At each application of the solution nearly all the leaves and young shoots would be completely destroyed, but with remarkable rapidity the underground rootstocks would send up a fresh supply of new shoots and the patch would soon be as green as ever. An attempt was made to destroy the rootstocks by cultivating and harrowing them to the surface of the ground and then spraying them with the Iron Sulphate. This process was repeated twice and, though each time many of the rootstocks were killed, plenty still remained in the ground to send up new shoots at the first opportunity. The result was that a month after the spraying was discontinued the Bindweed was just about as thick as when the experiment was started. It would thus seem to be impossible to eradicate Bindweed by means of spraying with Iron Sulphate.



Potato Sprayer used for Spraying Mustard with an Iron Sulphate Solution.

A small patch of Dandelions on the campus was staked out and sprayed with the Iron Sulphate. The first application destroyed nearly all the Dandelion leaves without doing any apparent harm to the grass. In a few days, however, new leaves made their appearance. These were again sprayed with the Iron Sulphate and destroyed, only to be replaced by a fresh crop, which, however, were not nearly so vigorous as the first lot and when they were destroyed only a few spindly leaves were produced and none of the plants flowered and produced seeds. It thus seems probable that if lawns infested with Dandelions were given five or six good sprayings with Iron Sulphate at proper intervals during the summer the Dandelions might be greatly diminished in number without any apparent injury to the grass beyond a slight discoloration. This, however, remains to be demonstrated by further experiments on a larger scale.

Field Chickweed was completely destroyed by one thorough application of Iron Sulphate. It would thus seem possible that Iron Sulphate might be profitably used to destroy Chickweed in orchards and gardens where it often necessitates frequent cultivation and hand hoeing.

Annual Sow Thistle, Canada Thistle, Curled Dock and Burdock were apparently little harmed by Iron Sulphate. The foliage at each application

would be only partially destroyed and the plants soon seemed to recover their natural vigor.

The test to destroy Mustard with Iron Sulphate was not conducted by the Botanical department, but by Mr. A. Leitch, B.S.A., manager of Donlands Farm, Donlands, Ont. This gentleman wrote to the Botanical department in June enquiring as to the efficiency of Iron Sulphate as a spray to kill Mustard. The information available on the subject was sent to him with the request that he would report the results of his efforts. A week later Mr. Howitt visited Donlands Farm and was surprised and pleased to see how completely the Iron Sulphate had destroyed the Mustard with little or no apparent injury to the barley crop. The following report kindly supplied by Mr. Leitch will, however, give the best account of the experiment and its results:

Number of acres sprayed, 26.

Cost of spraying:

Material	$11 56
Labor, 2 men 1¾ days at $1.60	5 60
Total cost	$17 16

Strength of mixture. 75 lbs. copperas to 40 gal. water.

Spraying machine, Power Spramoter, Model 1904.

Number of nozzles, 6 ordinary Vermorel nozzles.

Time of application, from 8 a.m. to 6 p.m., warm, sunny days.

Efficiency of Spray. At this date (June 26th) just twelve days after application, there is not a living Mustard plant in the field except those missed by the spray, while the fields on surrounding farms are in full bloom. It is quite noticeable, however, that those plants which were in bloom at the time of spraying have, in a few instances, formed seed, though the seed pods and seeds are dwarfed and unhealthy looking. Those plants which were not in bloom when the field was sprayed were entirely killed and formed no seed whatever. Therefore our observations lead us to believe that the proper time to spray is just before the blooming period.

Clover Seed Investigation.

During the past winter and spring a large number of samples of clover and alfalfa seeds were examined as to freedom from weed seeds, dirt, etc., with the following objects in view:

1. To determine as far as possible the condition of clover seed as sown in Ontario as regards the number and kind of weed seeds contained.

2. To ascertain the weed seeds that are most commonly found in the various kinds of clover seed.

3. To note the new weeds that are likely to be spread through the Province as impurities in clover seed.

4. To get some idea as to whether the germination capacity of a sample of clover seed can to any extent be determined by the plumpness and brightness of the seeds in a sample.

5. To demonstrate the loss caused by buying clover seed containing a large percentage of dirt and inert matter such as is too often found in clover seed offered for sale.

This work is still in progress and it is hoped that by next fall enough data will have been secured from which to draw some definite conclusions.

In closing it should be stated that while some of the samples of clover seed examined were those submitted to the department for test as to purity by farmers and seedsmen, most of them were collected and sent in by the various District Representatives of the Ontario Department of Agriculture who kindly co-operated in this work and to whom the thanks of the Botanical department are due.

Plant Diseases.

During the year the usual number of enquiries has been received with regard to plant diseases. Some of these affections were due to physiological or obscure causes, others to well recognized fungus parasites. Amongst those of the latter class on which advice was given, the following may be mentioned:—Late Blight of Potato (*Phytophthora infestans*), Grain Rust (*Puccinia graminis*), more particularly in its relation to the Common Barberry, Black Knot (*Plowrightia morbosa*), Rose Mildew (*Sphærotheca pannosa*), Pea Blight (*Ascochyta pisi*), Clover Leaf Spot (*Pseudopeziza trifolii*), a Lettuce Rot (*Septoria consimilis*), Apple Scab (*Venturia pomi*), and a Rhubarb Leaf Spot due to *Phyllosticta Rhei*.

Spray Pump used for Spraying Buds with Iron Sulphate Solution.

Fleshy Fungi.

A number of specimens of these fungi has been submitted to this department for identification and information. In some cases the inquiries have been prompted by motives of curiosity due to the peculiar appearance of many of the species. In other cases information was desired as to the edible or piosonous nature of the plants. Such information was supplied as far as is possible with our present imperfect knowledge of the culinary value of the various mushroom allies. One or two cases of trouble to mushroom growers through the appearance of large numbers of other fleshy fungi in the mushroom beds were investigated.

With a view to facilitating subsequent work in the identification of such material Mr. Eastham spent the greater portion of his vacation in

collecting, identifying and preserving specimens of Agaricineæ and Plyporaceæ. These specimens are now in the Herbarium, and it is hoped will form the nucleus of a collection which by further extension will become valuable for reference purposes.

Herbarium.

The work of last year has been continued and extended. The reference collection, numbering some 5,000 sheets, has been catalogued and the work of rearranging the specimens completed. A large number of new specimens has been added, chiefly selected from the collections required from students as part of their second and fourth year work. Many of the sheets added are those of common weeds, of which a large number of specimens is needed to replace those damaged by the wear and tear of class work, exhibits, etc. A number of new specimens, however, has been added to our collection, including the following:

Hypoxis hirsuta (L), Coville, (Star-grass); Ithaca, N.Y.
Stylophorum diphyllum (Michx), Nutt., (Celandine Poppy); London.
Arenaria macrophylla, Hook,, (Large-leaved Sandwort); B. C.
Lepidium ruderale, L., (Roadside Pepper-grass); Forest, Ont.
Sisymbrium canescens, Nutt., (Hoary Mustard); Haldimand, Ont.
Sisymbrium incisum, Engelm, (Tansy Mustard); Alberta.
Nasturtium sylvestre, R. Br., (Creeping Yellow Water-cress); Lincoln.
Erysimum parviflorum, Nutt., (Small Wormseed Mustard); Sask.
Hesperis matronalis, L., (Dame's Violet); Halton Co., Ont.
Thermopsis rhombifolia, (Nutt), Richards, (Prairie Thermopsis); Sask.
Petalostemon violaceus, Michx., (Violet Prairie Clover); Saskatchewan.
Astragalus pectinatus, (Hook.) Dougl., (Narrow-leaved Milk Vetch); Alberta.
Astragalus bisulcatus, (Hook.) Gray, (Two-grooved Milk Vetch); Alberta.
Viola rotundifolia, Michx., (Round-leaved Violet); British Columbia.
Hypericum prolificum, L., (Shrubby St. John's-wort); London, Ont.
Œnothera albicaulis, Pursh., (Prairie Evening Primrose); Alberta.
Vaccinium stamineum, L., (Deerberry); Ithica, N.Y.
Dodecatheon Meadia, L., var. frigidum, Gray, (American Cowslip); British Columbia.
Limonium Carolinianum (Walt.), Britton, (Sea Lavender); Mass.
Acerates viridiflora (Raf.), Eaton, (Green Milkweed); London, Ont.
Hydrophyllum appendiculatum, Michx., (Appendaged Water-leaf); London, Ont.
Cynoglossum virginicum, L., (Wild Comfrey); Komoka, Ont.
Mertensia paniculata (Ait.), Dom., (Tall Lungwort); Englehart, Ont.
Pycnanthemum linifolium, Pursh, (Narrow-leaved Mountain Mint); Komoka, Ont.
Buchnera americana, L., (Blue-hearts); London, Ont.
Plantago media, L., (Hoary Plantain); London, Ont.
Plantago Purshia, R. and S., (Pursh's Plantain); British Columbia.
Valeriana edulis, Nutt., (Edible Valerian); Springbank, Ont.
Centaurea solstitialis, L., (Barnaby's Thistle); O.A.C.

Respectfully submitted,

S. B. McCREADY.

PART V.

THE LECTURER IN PHYSICS.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to submit herewith my third report as head of the department of Physics.

INSTRUCTION.

(*a*) *Lecture Courses.*

In the first year the instruction in the department consists of courses in Arithmetic, Hydrostatics as a preparation for and followed by Soil Physics, and lastly a course in the principles of Mechanics. The work of the second year consists of Surveying, Drainage, and Farm Power and Farm Water Supply by electricity, wind and water. The third year make a specialty of Meteorology, Cold Storage, and Ventilation, based upon a thorough course in Heat. In the final year, Climatology, advanced Drainage, and advanced Soil Physics are emphasized.

(*b*) *Laboratory Work.*

Laboratory practice is given all the years, in the various subjects. With the increase in the number of students the capacity of our laboratories has become inadequate, with the present arrangement and equipment. I shall take the liberty of asking your consideration of a plan for increasing our laboratory capacity.

WEATHER REPORT.

Tables I. to III. give a summary of the weather data at representative stations which this department has equipped with the necessary meteorological instruments.

TABLE I. WEATHER REPORT OF 1908 AT THE O.A.C., GUELPH.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Mean temperature.....	20.9	17.3	31.9	38.8	55.9	65.4	69.5	65.2	64.5	50.9	37 5	24.4	45.2
†Departure from normal..	+ 1.0	— 1.6	+5.0	—2.5	+2.3	+2.2	+1.4	—1.0	+4.5	+4.5	+3.4	—0.4	1.8
Highest temperature	44.0	43.0	44.0	72.0	83.0	86.0	89.0	88.0	88.5	79.0	60.0	50.0	89.0
Lowest temperature.....	— 18.0	— 19.0	17.0	15.0	29.0	40.0	48.0	42.5	33.0	24.0	20.0	10.0	—19.0
Snowfall in inches.....	34.5	13 0	2.5	.....	.....	.....	.....	.....	.....	.....	4.0	10.5	64.5
Rainfall in inches.....	.....	1.05	1.13	1.33	3.47	3.21	3.25	2.75	.73	.81	.78	.50	19.01
*Precipitation in inches..	3.45	2.35	1.38	1.33	3.47	3.21	3.25	2.75	.73	.81	1.08	1.55	25.46
†Departure from normal..	+ 1.97	+ .75	+ .01	— .21	+1.10	+ .26	+ .28	+ .54	—1.53	—1.52	—1.01	— .15	— .11

* Calculated by ten inches of snow being equivalent to one inch of rain.

† Normals based on 21 years' observations.

Table II. Outside Stations.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug	Sept.	Oct.	Nov.	Dec.	Year.
Bay View, P.E.I.:													
Mean temperatures.....	20.6	18.5	25.4	32.0	41.9	56.9	64.9	61.7	59.8	51.1	34.7	21.2	40.7
**Departure from normal.	+ 2.9	+ 3.3	+2.1	—1.2	—0.9	+1.5	+2.3	+ .5	+2.3	+3.7	—0.8	—3.9	+ 1.0
Highest temperatures..	54.0	49.0	49.0	61.0	72.5	84.0	89.0	80 0	79.0	73.0	54.0	51 0	89.0
Lowest temperatures...	— 6.0	— 10.0	—5.0	6.0	29.5	36.0	40.0	39.0	39.0	28.0	25.0	—7.0	—10.0
Snowfall in inches.....	27.90	.....	.....	9.10	.03	.....	.....	.....	.....	.50	6.90	40.80	85.23
Rainfall in inches.....	1.73	.....	1.05	2.79	2.24	2.30	1.62	7.64	.9	2.71	4.17	2.49	29.64
*Precipitation in inches.	4.52	.....	1.05	3.70	2.25	2.30	1.62	7.64	.9	2.76	4.86	6.57	38.17
**Departure from normal.	+ .41	— 1.92	— .62	+ .35	— .29	+ .63	—2.76	+1.36	—2.78	— .92	+1.22	+1.50	— 3.83
Demonstration Farm (Northern Ontario):													
Mean temperatures.....	.....	.....	18.5	31.5	48.6	60.2	64.0	58.4	53.7	40.1	22.4	7.8	.....
Highest temperatures..	.....	.....	55.0	65.0	85.0	93.0	95.0	89.0	84.0	74.0	53.0	42.0	95.0
Lowest temperatures...	.....	.....	-30.0	-22.0	20.0	24.0	30.0	34.0	24.0	9.0	2.0	-35.0	.....
Snowfall in inches	.....	.....	5.0	2.5	.....	.....	.....	.....	.....	1.00	18.0	25.5	.....
Rainfall in inches.....	.....	.....	.....	.....	2.22	3.19	4.35	3.45	2.60	3.40	.....	.....	.....
*Precipitation in inches.	.....	.....	.50	.25	2.22	3.19	4.35	3.45	2.60	3.50	1.80	2.55	.....
Jordan Harbor (Lincoln)													
Mean temperatures.....	.....	.....	35.9	42.0	52.8	65.9	70.8	68.1	62.5	48.5	39.6	30.1	.....
Highest temperatures..	.....	.....	68.0	68.0	86.5	90.0	91.0	92.0	90.0	81.0	63.0	61.0	92.0
Lowest temperatures...	.....	.....	18.0	22.0	30.0	43.5	52.0	46.5	40.0	20.4	22.0	11.0	.....
Snowfall in inches	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.85	2.4	.....
Rainfall in inches.....	.....	.....	.81	1.42	2.45	2.41	4.39	1.02	.62	2.88	1.30	1.20	.....
*Precipitation in inches.	.....	.....	.81	1.42	2.45	2.41	4.39	1.02	.62	2.88	1.39	1.44	.....
Leamington (Essex Co.):													
Mean temperatures.....	25.8	20.4	34.8	44.4	57.7	67.6	72.5	69.3	66.3	53.0	39.0	28.9	48.3
**Departure from normal.	— 0.1	— .2	—1.4	+2.9	+4.4	+2.2	+0.4	+0.8	+2.3	+2.9	+0.3	—0.5	+ 1.1
Highest temperatures ..	41.0	42.0	59.0	75.0	85.0	87.0	90.0	92.0	87.0	78.0	63.0	49.0	92.0
Lowest temperatures ...	— 2.0	— 8.75	13.0	19.0	30.0	37.0	47.0	46.0	41.0	29.0	20.0	10.0	— 8.75
Snowfall in inches.....	6.25	21.5	.....	1.00	.....	.....	.....	.....	.....	.....	.....	.5	29.25
Rainfall in inches.	2.01	.47	2.66	1.99	2.52	2.25	2.36	5.58	10	1.46	.73	.20	22.33
*Precipitation in inches	2.64	2.62	2.66	2.09	2.52	2.25	2.36	5.58	.10	1.46	.73	.25	25 26
**Departure from normal.	— 1.37	+ .59	+ .16	+ .05	+ .10	—1.26	— .5	+2.20	—2.38	— .56	— .87	—1.11	— 6.99
Magnetawan (Parry Sound)													
Mean temperatures.	9.3	8.7	21.0	33.8	51.9	60.1	65.3	61.3	60.2	46.5	33.4	19.5	39.3
†Departure from normal.	— 5.2	— 0.6	+1.3	—0.9	+5.0	—0.7	+0.9	—0.8	+2.4	+3.8	+2.9	+3.5	+ 0.4
Highest temperatures ..	38.5	40.5	49.0	66.5	80.5	84.0	89.0	85.0	86.0	74.0	58.0	54.0	89.0
Lowest temperatures...	— 35.5	— 37.0	-10.0	—6.0	25.0	30.5	44.0	35.5	31.0	18.5	14.0	-23.0	—37.0
Snowfall in inches.....	24.6	32.7	9.5	8.8	.....	.....	.....	.....	.....	.....	12.20	39.30	127.10
Rainfall in inches.....	.38	.05	1.07	1.54	3.07	1.03	2.50	2.53	2.13	1.23	1.74	.....	17.27
*Precipitation in inches.	2.84	3.32	2.02	2.42	3.07	1.03	2.50	2.53	2.13	1.23	2.96	3.93	29.98
†Departure from normal.	— .59	+ 0.64	—0.69	—0.18	+0.83	—2.15	+0.90	—1.82	—0.86	—1.95	—0.49	+ .74	—5.57
Maitland: (Grenville Co.)													
Mean tempertures.....	16.4	6.6	24.8	36.4	54.9	64.8	70.5	66.6	64.1	52.3	38.2	19.5	42.8
†Departure from normal.	—1.4	—3.3	+7.8	—1.0	+4.1	+0.2	+2.4	—0.6	+1.6	+4.6	3.2	+1.0	—1.5
Highest temperatures...	41.0	38.0	50.0	65.0	82.0	86.0	92.0	85.0	84.0	79.0	60.	55.0	92.0
Lowest temperatures...	—28.0	—36.0	—3.0	11.0	33.0	39.0	50.0	43.0	39.0	29.0	21.0	—11.0	—36.0
Snowfall in inches.....	4.6	3.15	3.10	.....	.....	.....	.....	.....	.....	.....	1.00	12.00	23.85
Rainfall in inches	.....	2.03	1.35	2.83	4.77	2.25	4.04	1.40	1.12	1.95	.50	.....	22.24
Precipitation in inches..	4.6	2.35	1.66	2.83	4.77	2.25	4.04	1.40	1.12	1.95	.60	1.20	24.63
†Departure from normal..	—.95	+.98	—.10	+.62	+.69	—1.18	+1.89	+.25	—1.55	—.46	—1.38	—1.05	—1.13
Marksville: (St. Joseph Is.)													
Mean temperatures.....	20.9	17.1	23.3	35.1	51.0	60.0	65.9	62.1	60.3	47.9	35.6	21.5	41.7
†Departure from normal.	+1.3	+1.3	0.0	—2	+4.1	—.6	+1.0	—.3	—1.1	+3.4	+1.4	+1.5	+1.0
Highest temperatures...	37.0	41.0	49.0	59.0	73.0	83.0	87.0	82.0	82.0	78.0	57.0	43.0	87.0
Lowest temperatures....	2.0	0.	3.0	4.0	25.0	34.0	41.0	39.0	31.0	22.0	16.0	3.0	0.0
Snowfall in inches.....	8.0	40.0	27.0	5.0	.....	.....	.....	.....	.....	.....	4.0	30.0	114.0
Rainfall in inches.....	1.0	.5	.....	2.54	5.28	2.85	5.58	3.04	2.79	1.08	3.78	.....	28.44
*Precipitation in inches.	1.8	4.5	2.7	3.04	5.28	2.85	5.58	3.04	2.79	1.08	4-18	3.00	39.84
†Departure from normal.	—2.	+2.4	+.04	+1.40	+1.65	—.79	+2.22	—.17	—1.06	—1.23	+1.12	+0.95	+6.31
St Catharines: (Lincoln Co.)													
Mean temperatures	25.5	19.9	33.4	42.6	54.7	66.6	70.4	67.3	66.1	54.1	39.8	29.9	47.5
**Departure from normal.	.....	+1.0	—.4	+2.4	+6.4	+2.0	+.2	+.5	+1.1	+3.7	+0.9	—0.6	+0.6
Highest temperatures...	42.0	43.0	65.0	72.0	87.0	89.0	92.5	93.0	92.0	83.0	67.0	62.0	93.0
Lowest temperatures...	—1.0	—4.0	16.0	22.0	30.0	43.0	53.6	45.0	39.0	29.5	21.0	+7.0	—4.0
Snowfall in inches.....	7.75	15.5	2.01	.....	.....	.....	.....	.....	.....	.....	2.50	5.00	32.79
Rainfall in inches.....	1.52	1.99	2.40	2.11	2.70	.....	.....	2.73	.71	.75	1.19	.60	.....
*Precipitation in inches	2.30	3.54	2.60	2.11	2.70	.....	.....	2.73	.71	.75	1.44	1.10	.....
**Departure from normal.	.....	+1.01	—.22	+.39	—.18	.....	.....	+.60	—1.32	—.93	—.63	—1.78	.....
Sturgeon Lake : (Victoria)													
Mean temperatures.....	17.8	14.9	24.0	37.7	54.4	64.8	69.3	65.3	63.1	49.1	35.5	21.6	43.1
Highest temperatures...	38.0	42.0	+47.0	67.0	83.0	88.0	93.0	87.0	87.0	78.0	60.0	56.0	93.0
Lowest temperatures....	0.0	0.0	0.0	13.0	27.0	39.0	48.0	40.0	34.0	24.0	10.0	1.0	0.0
Snowfall in inches.....	16.0	28.0	6.0	2.5	.....	.....	.....	.....	.....	.....	6.50	15.0	74.00
Rainfall in inches.....	.....	.6	.2	2.25	2.39	.56	2.85	1.40	1.35	.30	1.50	.....	13.40
*Precipitation in inches	1.6	3.4	.8	2.50	2.39	.56	2.85	1.40	1.35	.30	2.15	1.50	20.80
Walkerton : (Bruce Co)...													
Mean temperatures.....	.....	.....	.....	41.6	56.4	64 8	69.2	64.7	61.5	51.1	40.2	25.4	.....
Highest temperatures...	.....	.....	.....	71.0	85.0	90.0	92.0	91.0	90.5	78.0	60.0	38.0	.....
Lowest temperatures....	.....	.....	.....	14.0	29.0	35.0	46.0	40.0	36.0	26.0	24.0	12.0	.....
Snowfall in inches.....	.....	.....	.....	6.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rainfall in inches.....	.....	.....	.....	2 63	3.27	2 63	2.38	.56	1.68	.84	2.87	.30	.....
*Precipitation in inches	.....	.....	.....	3.28	3.27	2.63	2.38	.56	1.68	.84	2 87	.30	.....

*Calculated by ten inches of snow being equivalent to one inch of rain.

**Normals based on two years' observations. † Normals based on three years' observations.

TABLE III. LENGTH OF SEASON AT VARIOUS STATIONS.

Station.	Last killing frost in spring.		First killing frost in autumn.		No. of days between.	Average length of season free from killing frost.
	Date.	Deg.	Date.	Deg.	1908.	
Guelph	May 2	30	Oct. 3	25	154	*145 (21)
Bay View, P.E.I.	" 16	29.5	" 21	28	158	149 (2)
Demonstration Farm	July 20	30	Sept. 3	24	45	.....
Jordan Harbor	May 23	30	Oct. 21	30	151	.....
Leamington	" 3	30	" 12	29	162	158 (2)
Magnetewan	" 5	25	" 3	24.5	151	125 (3)
Maitland	" 29	14	" 3	29	127	142 (3)
Marksville	" 5	26	" 2	26	150	131 (3)
St. Catharines	" 4	30	" 12	29.5	161	162 (2)
Sturgeon Lake	" 7	27	" 3	27	149	.....
Walkerton	" 5	29	" 3	29	151	.....

* Numbers in brackets denote number of years observations from which averages are taken.

In Table No. II. we find four new stations—to one of which, viz.: Demonstration Farm, I wish to call attention. It is located in the Abitibi region, in the Great Clay Belt of New Ontario, 350 miles north of Toronto, as the crow flies, and about 180 miles from the James Bay. At the suggestion of the Hon. Nelson Monteith an observing station was established in order that the Department of Agriculture might have some definite knowledge as to the climatic conditions existing there. Perhaps the best way to gain an idea of the climate of the Great Clay Belt is by comparison, each reader choosing for the purpose the station in Old Ontario with which he is most familiar. We in Guelph, for instance, would make the following comparisons:—

TABLE IV.—Comparison of Climates of Guelph and Demonstration Farm.

	Mean Temperature.		Highest Temperature.		Lowest Temperature.		Precipitation.	
	Guelph.	Dem. Farm.	Guelph.	Dem. Farm.	Guelph.	Dem. Farm.	Guelph.	Dem. Farm.
March	31.9	18.5	44.0	55.0	17.0	—30.0	1.38	.50
April	38.8	31.5	72.0	65.0	15.0	—22.0	1.33	.25
May	55.9	48.6	83.0	85.0	29.0	20.0	3.47	2.22
June	65.4	60.2	86.0	93.0	40.0	24.0	3.21	3.19
July	69.5	64.0	89.0	95.0	48.0	30.0	3.25	4.35
August	65.2	58.4	88.0	89.0	42.5	34.0	2.75	3.45
September	64.5	53 7	88.5	84.0	33.0	24.0	.73	2.60
October	50.9	40.1	79.0	74.0	25.0	9.0	.81	3 50
November	37.5	22.4	60.0	53.0	20.0	2.0	1.08	1.80
December	24.4	7.8	50.0	42.0	10.0	—35.0	1.55	2.55

The first two columns show for every month a lower mean at Demonstration Farm in Northern Ontario, than at Guelph. The second two, with the exception of March, show that in Northern Ontario the maximum temperatures for Fall, Winter and Spring are lower than at Guelph, and the Summer maximums (June, July and August) higher, giving a climate of greater extremes than Guelph. I am unable to explain the unusually high maximum at Demonstration Farm in March. On or two other places that are north of Guelph also shew a higher maximum for March than does the latter. The sixth column shews that there was frost at Demonstration Farm in every month but August, that in July not being very severe, only two degrees below freezing. And comparing columns five and six we see that Demonstration Farm had in all months lower *minimum* temperatures than had Guelph. The precipitation, shewn in the last two columns, is also worthy of notice. For the first eight months of the year precipitation at Guelph was much in excess of the normal (see Table I.), but during September, October and November it was very low, amounting to only one-third the average for those months during the last twenty years. Precipitation at Demonstration Farm has been the reverse of that of Guelph (columns 7 and 8, Table IV.), viz., scant in the early months but excessive from July to December.

In connection with the reports it may be of interest to record that our observer, Mr. W. McLaren, sent us from the north in September samples of potatoes, cucumbers, tomatoes, and oats grown there. They were all fine samples, the oats being extra well filled with plump, heavy grain. In commenting on the samples Mr. McLaren says: "The seeds were all planted at the end of May, with exception of the tomatoes, which were planted late in June. We had ripe tomatoes to-day, September 13th. We have also had lettuce, peas, beans and parsley." These facts are important as shewing that successful agriculture is possible even as far north as the Great Clay Belt.

Besides establishing four new stations we have made an important addition to our meteorological equipment at the O. A. College, viz: an anemometer and an anemograph, the former to measure the wind, the latter to record the measurements. Referring to the records made by the instruments we are able to tell the velocity of the wind in miles per hour at any instant in the day or for any portion of it.

Table V. will give an idea of the wind velocities throughout the year. The highest record for any whole hour was 45 miles. In some cases there were short gusts of much greater velocity, reaching as high as 100 miles per hour for a minute or so.

TABLE V. WIND RECORDS AT GUELPH.

	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total 10½ mos.
Miles of wind during month....	4,482	9,263	10,636	9,422	5,013	5,976	6,031	5,231	5,002	9,102	11,287	81,445
Number of days.....	15.5	30.9	29.2	24.0	21.0	30.0	30.5	26.0	21.0	30.0	31.0	289.1
Average per day.....	289.1	300.0	364.3	311.9	238.7	199.2	197.7	201.2	238.2	303.4	364.1	281.7
Average per hour.....	12.0	12.5	15.2	13.0	9.9	8.3	8.2	8.4	9.9	12.6	15.2	11.8
Windiest day, miles.....	470	640	756	487	398	462	339	484	407	707	688	756
(1) Per hour.....	19.6	26.7	31.5	20.3	16.6	19.2	14.1	20.2	17	29.5	22.2	31.5
(2) Windiest hour, miles.....	25	44	39	27	27	27	26	27	25	41	37	44.0
(3) Least windy hour, miles...	10	13	20	18	5	10	3	17	12	20	20	20.0
Calmest day, miles.....	129	48	151	134	148	77	52	59	100	65	133	48.0
(1) Per hour.....	5.4	2.0	6.3	5.6	6.2	3.2	2.2	2.5	4.2	2.7	5.5	2.0
(2) Windiest hour.....	11	5	11	10	10	7	7	7	8	9	9	5.0
(3) Calmest hour.....	3	0	3	1	3	0	0	0	0	0	0	0

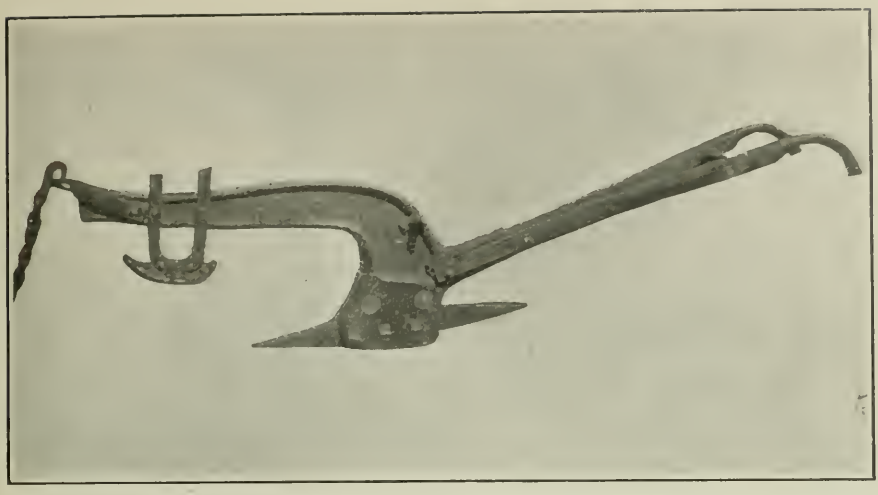


FIG. 1. The Pick Plow (see page 51).

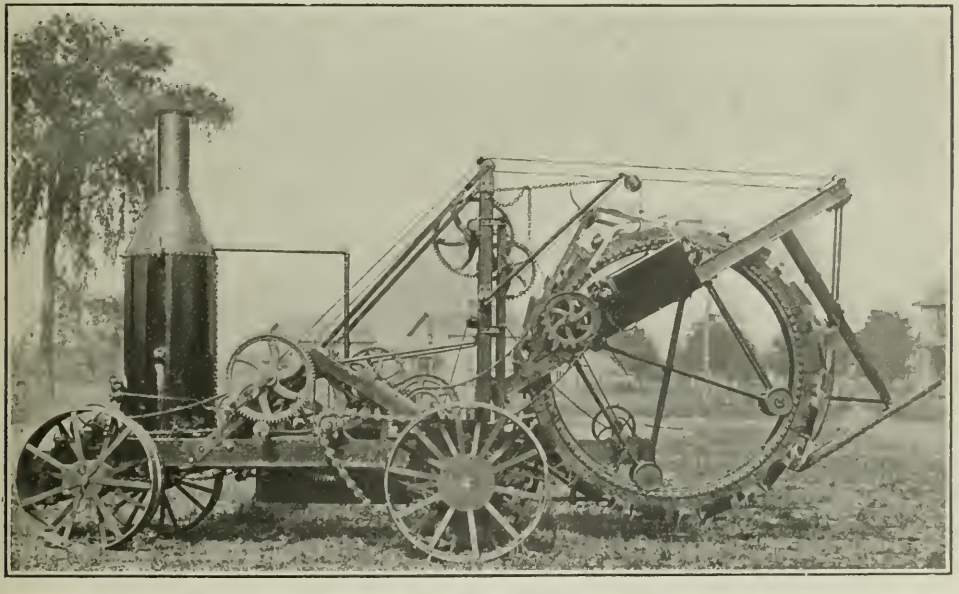


FIG. 2. Ditching Machine. Wheel elevated, ready for travel. (See page 52.)

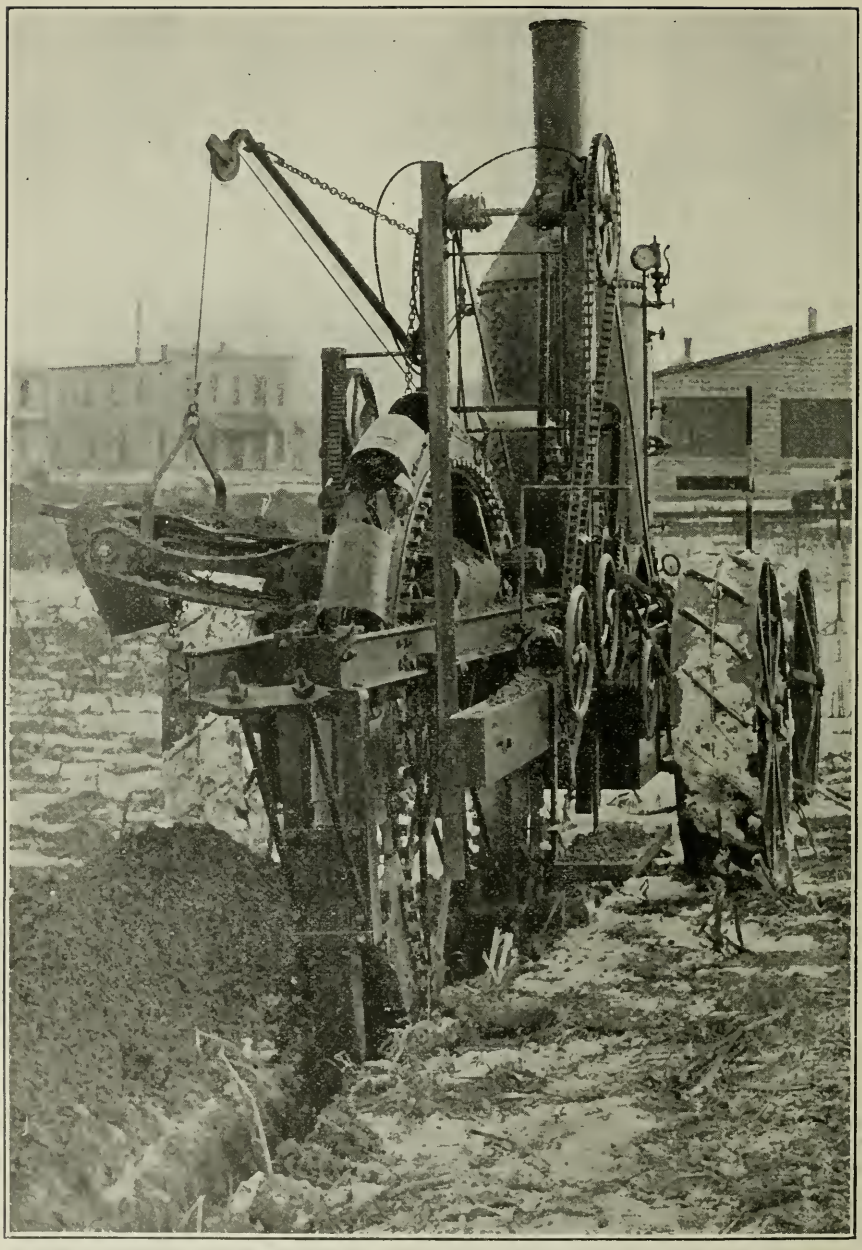


FIG. 3. Ditching Machine in operation. (See page 52.)

Lightning Report.

Reports of damage done by lightning have been collected this year as previously. The results are given in tables VI. to IX.

Table VI. Buildings Struck in 1908.

How reported.	Barns.				Houses.				Others.			
	Burned.	Damaged.	Totals.	Loss.	Burned.	Damaged.	Totals.	Loss.	Burned.	Damaged.	Totals.	Loss.
				$ c.				$ c.				$ c.
Personally	12	3	15	29,817 50	1	4	5	1,086 50	....	4	4	180 20
Newspapers	17	2	19	*37,768 77	2	6	8	*1,738 40	....	4	4	*360 40
Totals	29	5	34	67,586 27	3	10	13	2,824 90	....	8	8	540 60

* Loss at same rate as on those personally reported.
Total loss on all building $70,951.77.

Table VII. Other Information Regarding Barns.

Barns personally reported.

Windmill.	
Mill on or near	3
No mill	10
Not specified	2
Location.	
On hill	3
On knoll	3
On plain	5
In valley	2

Distance from railway.	
1-80 mile	1
1-11 "	1
½ "	2
1 "	2
2 "	1
3 "	1
3½ "	2
4 "	2
6 "	1
Not specified	2

Table VIII. Animals Struck.

Animals.	In field.	By fence.	Under tree.	In or near building.	Location not reported.	Totals 1908.	Totals 1901-1908.
Cattle	1	.....	3	1	25	29	251
Sheep	.....	1	.....	.....	.....	1	138
Horses	1	.....	.....	1	.....	2	73
Pigs	.....	.....	.....	1	.....	1	22

Table IX. Summary of Trees Struck from 1901-1908.

Year.	Elm.	Pine.	Oak.	Maple.	Apple.	Basswood.	Poplar.	Ash.	Willow.	Hemlock.	Cedar.	Balsam.	Spruce.	Chestnut.	Hickory.	Birch.	Cherry.	Beech.	Butternut.	Fir.	Walnut.	Pear.	Thorn.	Total.
1901-1907	40	25	15	10	8	7	6	5	5	4	4	4	4	2	2	2	..	1	1	1	1	1	1	149
1908	...	...	1	2	...	...	...	...	...	1	...	...	...	...	...	...	2	..	...	...	...	...	...	6
	40	25	16	12	8	7	6	5	5	5	4	4	4	2	2	2	2	1	1	1	1	1	1	155

The number of buildings reported this year is only about half the number last year.

None of the buildings personally reported were provided with lightning rods, though one house had an iron ladder which the claims adjuster says saved the building from destruction.

We sometimes hear it claimed that windmills are dangerous, sometimes that they are a protection. From reports we cannot conclude either way, for taking the country over, many more barns are without mills than with them, likewise most of the barns personally reported have none.

With regard to location we sometimes hear it claimed that an elevated spot is more likely to be struck by lightning than is a low one. Yet it is a curious fact that last year the number of barns reported as being situated on a *plain* was more than double the number on either hill or knoll, greater indeed by one than on both hill and knoll combined. This year again the number on a plain is greater than either on a hill or a knoll, and less by one than the two combined. Hence taking the two years' reports together the number situated on a plain is exactly equal to the number on hills and knolls combined. We have no statistics as to the classification of barn sites in Ontario, but we know that a knoll, hill or hillside is usually chosen if available. We know also that many portions of the country are very flat so that there is no choice in the matter of site—the barns have to be built on the plain. On the whole I would think that the number of elevated sites about equals the number of sites on the level. If this estimate is correct then our reports would seem to show that neither class of site is more favourable to lightning stroke than the other.

None of the buildings reported are very far from railways, yet no great percentage of them are so close as to indicate that proximity to railway is a source of danger as sometimes claimed.

Last year the number of persons reported as being struck was 21, of whom 6 were killed. This year the number is 27, of whom 11 were killed.

DRAINAGE.

Surveying and Demonstrations.

The drainage campaign carried on by this department for the past four years has been continued this year, and extended. Throughout this work we have been conscious that its most valuable aspect was not the material assistance given to the individual whose farm we surveyed, but the educational influence upon the community, first of a man with a thorough knowledge of drainage operations, and second of a practical illustration of the benefits of drainage, a farm or a field noted for its poor crops transformed by drainage into one equally noted for good crops. To increase the educational value of the work we have this year held a Drainage Demonstration, a field meeting to discuss drainage in all its aspects, in each community where we have done surveying. The demonstrations have in the main been well attended, the number sometimes reaching 50 and over, though occasionally owing to local conditions, or the business of the time the attendance was small. Frequently the neighbors from the farms lying adjacent to the one being surveyed would come at the beginning of the survey and remain throughout. This of course is the best kind of demonstra-

tion, for these men not only grasp the details of the survey, but ask and receive answers to numerous questions about the construction of drains and the way in which they produce their beneficial effects.

The value of this work to the farming community is shown in two ways, first by its growth in popularity:

In 1906 we had 15 applications and made 15 surveys.

In 1907 we had 126 applications and made 70 surveys.

In 1908 we had 166 applications and made 100 surveys.

We have had applications this year from every county west of Peterborough and from several east, making 30 in all, and we have made surveys and held demonstrations in twenty-five of these. Second, by increased interest in drainage, a practical illustration of which is to be found in the vicinity of the Horticultural Experiment Station at Jordan Harbor. Three years ago scarcely a man in that locality was underdraining. We surveyed the farm at the Station and a complete system of underdrains was put in during 1907. Now nearly every man in the locality whose land is too wet is either underdraining or preparing to, so great was the transformation in the Rittenhouse farm. The same thing is being enacted in the various districts where the seed sown has had time to bear fruit. The benefit arising from two or three hundred such centres of influence must in the aggregate be very great. Every acre of land drained becomes at once more productive, the increase in crops ranging from 10% to 100% or even more, depending on how badly drainage was needed, the average increase being probably from 25% to 50%.

To help the department to meet the largely increased demands upon its services a special appropriation of $1,000 was voted by the Legislature by means of which we were enabled to engage extra men for the work. The men employed were as follows:

J. H. Hare, B.S.A., for part of summer.

D. A. MacKenzie, B.S.A., for balance of summer.

W. R. Reek, O. C. White, Associates, O.A.C., for entire summer.

The first three were engaged in survey and demonstration work and Mr. White in drafting. In addition to these four, either Mr. Thom or I was in the field too, the other remaining at the department to conduct the correspondence and lay out routes for the field men. The services of these extra men have been highly satisfactory both to the department and to the people served as shewn by the numerous commendatory letters received.

Drawbacks to Ditching Operations.

The greatest drawbacks to ditching operations in Ontario to-day are the scarcity of labourers, the slowness of the pick and shovel method of digging, and the reluctance of old-time ditchers to adopt improved methods. In most soils and in average seasons it is only for a short time in spring and fall that the spade alone is equal to the task of digging a trench for tile. At other times the pick would have to be used and this would make the digging cost so much more than in spring and fall, that during July, August and September, the finest months of the year for ditching operations, they are at almost a complete standstill throughout the Province. Now this trouble might be overcome by the pick-plow, an illustration of which is shown on page 47, Fig. 1.

During the past summer Mr. W. D. Breckon, manager of the Osler farm at Bronte, Ontario, installed twenty-two miles of tile drains. The pick-plow was used most of the time, but occasionally it was not, and then the pick was used. It was found that a gang of Italians using pick and

shovel could dig 3 rods per man per day, but the same gang using the pick-plow could dig 4¼ rods per man per day, or 41⅔ per cent. more than with the pick and shovel. Hence if the pick-plow were generally introduced into ditching operations it would materially lessen the cost of digging, and even in the middle of the summer by its use drains could be dug at the prices now paid for spading in spring and fall. But the orthodox ditcher objects to using anything but the spade and occasionally the pick and shovel Another factor that stops ditching operations in summer is the lack of water to dig by. In Essex County, for example, the ditching is nearly all done by the old fashioned method of having water in ditch by which to determine the grade. This can be had only in spring and fall. Thus for months ditchers in that county are lying idle, while the farmers are anxious to have the work carried forward. Now, the "over-head line method," which was described in last year's report of this department and which is fully described in our "Farm Drainage Operations" pamphlet which we have for distribution, is just as accurate as the water method, and may be used when the land is dry as well as when it is wet. We would commend it to the consideration of any one intending to do ditching.

But even if all the ditchers in Ontario were to use up-to-date methods and work all the summer through, they would not be able to do all the ditching now contemplated, and which the farmers have not time to do themselves. Where there is a large amount to be done, as at the Horticultural Experiment Station last year (11 miles) or at the Osler farm at Bronte this year (22 miles) it is feasible to put on a large gang of Italians, engaging a competent man to oversee the work. The operations may then be carried forward rapidly but the cost is somewhat greater than if done by a few, for the gang does not accomplish as much per man per day as an individual workman where only a few are engaged.

Ditching Machines.

All these drawbacks making themselves felt in various parts of the Province have led to the frequent enquiry "Is there any machine that will dig these ditches satisfactorily." Until recently we have had to answer this question in the negative, for although we heard of several ditchers being tried there was some drawback to them all. Some time during the autumn, however, it was reported to us that Mr. Jacob Schihl, of Woodslee, Essex County, had a ditcher that was giving satisfaction. Accordingly I went to see it working, taking a surveyor's level along to test the grade left by it. I watched it carefully for two and a half hours, or one-quarter of a day. In that time in very heavy clay it dug 30 rods of ditch full depth in one transit over the ground leaving the most beautiful ditch bottom I ever saw. This is equal to 120 rods a day, not allowing for laying out ditch. It averages from 90 to 100 rods a day, I am told, including all stops and the laying out of the drain. It is a traction machine and is operated by two men. Figure 2 shows the ditcher (see pages 47 and 48) all ready for travel. Figure 3 shows it in operation. In the hands of a careful workman it digs true to grade no matter what the unevenness of the ground traversed, leaving the ditch bottom ready for the tile. The price charged by Mr. Schihl per lineal rod was 7 cents for each foot in depth; that is 17½ cents a rod for a ditch 2½ feet deep and 21 cents a rod 3 feet deep, the farmer supplying the fuel and boarding the men. The fuel amounts to about 2 cents a rod if one has to buy it, but around a farm there is usually considerable refuse which may be burned, thus reducing the outlay for fuel to practically nothing, and the board of two men and one horse amounts to 1½ cents a rod, mak-

ing the total cost of a 2½ foot ditch 21 cents and of a 3 foot ditch 24½ cents. Digging by hand and plow in that same heavy soil, would cost from 40 to 50 cents a rod 3 feet deep, and even in the lightest soils about 25 to 30 cents. Hence if a few of these machines were introduced into Ontario and ditches dug at the same price as in Essex the price of underdraining would be reduced very materially. Where there are stone to contend with the price would be somewhat higher than in Essex.

Being so favorably impressed with this machine, which is a 1905 model, I visited the manufacturers, the Buckeye Traction Ditcher Co., of Findlay, Ohio, to see the later types. These are improved in many details. There I saw one digging 5 feet per minute, or 180 rods per day, and the manager made the proposition that they would dig 7 feet a minute or 252 rods a day on condition of selling the machine. In Ohio in prairie soil the price of digging is 10 cents a rod for the first two feet, and half a cent an inch thereafter, making a 3 foot ditch cost 16 cents for digging, a total cost of 19½ cents a rod when the price of fuel and board is added. This is very cheap ditching. Of course we could not expect so low a rate in Ontario, for the duty on a machine being imported is about 30 per cent. and the freight is considerable. The price of the ditcher varies with the size. The smallest, cutting a trench 11½ inches and any depth down to 4½ feet, costs $1,200, f.o.b. Findlay. The next size 14½ inches x 4½ feet, $1,400, and the next 15 inches x 5½ feet, $1,700, special steel machine of third size for stony ground, $2,400. Much larger ones are made for contract work. I saw one capable of cutting a trench 26 inches wide and 10 feet deep, another 42 inches by 7½ feet and others for digging open ditches with sloping sides. Mr. Schihl, whose machine is of the smallest size, says he would buy a larger one again, because it is built stronger, and will handle stones better. Personally, I would favor the third size for the two reasons already given, and also because occasionally one must, in going through a knoll, go deeper than 4½ feet, which of course the first two cannot do.

The mention of stones suggests the query whether the machine will work in stony land. The College of Agriculture at Cornell University, Ithaca, has the special steel machine equipped with rooters and steel cutters to enable it the better to handle stones. Prof. Minns writes me that it has given good satisfaction even where numerous stones occur. Of course the speed is slower, and sometimes it is necessary to raise the digging wheel and dig out a large stone by hand. Smaller ones are elevated by the machine. In *very* stony land the company does not recommend it; such land, however, is not drained as a rule. Prof. Minns states that in good land their machine is perfection.

I have written this lengthy report in the hope of interesting some one in various parts of the Province to the extent possibly of investing in one of them and then doing ditching in their vicinity as Mr. Schihl is doing in Essex. Mr. Schihl states that he could be busy all the time with it if his other duties would allow him. The outlay would be $1,500 to $3,500 depending on the size and type of machine, and the earning power along with two men $18 to $21 a day at present Essex prices. Query: "How long would it take to pay for itself? How much longer would it last?" For anyone in a position to undertake it, wouldn't this be a good investment? Of course one would have to run the risk of not being busy all the time.

One other point should be mentioned, viz.: that one of the two men with a machine should have some knowledge of levelling and determining grades and in fact drainage surveying in general. Some knowledge of the theory of drainage would be helpful too.

I am strong in the hope that more of these machines will be introduced into Ontario in the near future, thereby bringing a solution of some of the difficulties with which the farmer doing draining finds himself confronted.

Cement Tile.

We have had many enquiries as to the cost of making cement tile, so we determined to make some in order to inform ourselves on the point and enable us to answer the question. We wrote the London Concrete Machinery Co., of London, Ontario, telling them our purpose and they kindly donated to the department one of their tile machines, and with it our tests were made. Mr. A. M. Shaw, a third year student, who has had considerable experience with cement and who is investigating some phases of drainage for his Fourth Year thesis, made the tests for us, so that the work was done by an experienced man.

Some difficulty was encountered at first in getting the mortar of the right consistency. It must be wet enough that the tile will make the "initial set," yet dry enough that they will lift off the moulds without sticking. The wetter they can be made and yet come away *smooth* the better the cement. At first to get them to come off right we had to mix the mortar so dry that onlookers vowed the tile would "never set," but they did, provided they were kept shaded so as to remain moist for about a day. If exposed to the hot sun or a drying wind or both during the first few hours they dried out too quickly and would never make good tile. Water is essential to the proper setting of cement. By oiling the moulds, however, we found that the mortar could be made fairly wet and yet the tile not stick, but come off smooth and perfect in shape. Still the mortar was far from what is known as "slush" and hence there was not in it enough water to make good cement, and it was found that the direction accompanying the machine to "keep the tile moist for one week after making" was a very essential part of cement tile manufacture. On no account should this direction be violated.

The proportions of sand and cement is a matter of choice. The directions say 7 to 1, but we used mostly 6 to 1. Either makes a tile strong enough to withstand all the pressure to which it will ever be subjected. As to durability we are not in a position to speak from actual test but very energetic investigations are being carried on at several experiment stations in the United States to determine the life of cement tile. Montana has shewn (Bulletin 69) that alkaline water in the soil will bring about the disintegration of cement tile in a few years. This week I am in receipt of a pamphlet published by Brick, of Chicago, giving results of investigations carried on by Messrs. G. G. and A. J. Wheat, of Emmetsburg, Ia., assisted by Dr. Nicholas Knight, chemist, of Cornell College, Mt. Vernon, Ia. These gentlemen give what appears to be indisputable evidence that thoroughly cured cement tile six months old, 1-5 cement and hard and strong almost as a clay tile is soluble in water, so much so indeed that at the same rate all the cement in it would be dissolved in about 3 3-5 years. In ordinary soil water it was a little less soluble. Hence with water continually passing through the pores (cement tile is very porous) the tile in the drain must in a few years reach the point of disintegration, much as a soft stone crumbles. They also claim that acid soils are especially destructive of cement tile. I am also in receipt of a booklet, published in Detroit, entitled "Cement Tile," devoted to the refutation of the arguments set forth in the Brick pamphlet. It claims that Messrs. Wheat's investigations have

been limited, and biased, and moreover their own figures show that the rate of solution drops off rapidly, that only a small portion of the cement is soluble, and that hence the tile cannot "crumble as so much sand," as Mr. Wheat claims they will. After reading both pamphlet and booklet one is still left wondering whether cement tile will really prove durable. A year or two of investigation should pretty well settle the point.

Now as to cost: Mr. Shaw found that 6 cubic feet of sand and 1 bag of cement (a bag contains approximately 1 cubic foot) would make 78 complete 3-inch tile, say 75, in case a few might be spoiled, and that he could make one "batch" in 1 hour and 25 minutes, doing all work himself. At this rate he would make 546 complete 3-inch tile in a day, at 78 tile per batch, or 525 at 75 per batch. With these facts to work with and knowing the price of materials in his own locality any man in Ontario can calculate for himself at what cost he can make cement tile.

The hauling of material may be offset against the hauling of clay tile, so that arriving at a comparison between the two this factor may be omitted. Let us "figure" on a day's work for one man. 525 tile—7 batches,—approximately. Therefore 7 bags of cement, or 1¾ barrels are needed and 7 times 6 cubic feet or 42 feet of sand, or about 1½ yards of sand. Hence for one day's work the outlay would be:

1½ yards sand at 8 cents	$ 12
1 day's wages at $1	1 00
1¾ barrels cement at $1.90	3 33
Total for 525 tile	$4 45

At this rate 1,050 tile would cost $9.90 and 1,000 tile $9.33. The prices quoted by the gentleman are lower than can be obtained in Guelph, and they are probably lower than in many other parts of Ontario, but as pointed out before the reader can use the prices prevailing in his own district and determine the cost of making this kind of tile. And if he finds that he can make the tile cheaper than clay, then he must consider whether the difference is sufficient, and whether he needs enough tile to pay him to go to the expense of buying a tile machine. This first cost, as well as some other details, may be best answered by reference to the instance now about to be given.

In the early summer one of our field men made a survey for Mr. Clarence Abbott, of Cultus, Ontario, some fourteen miles south of St. Thomas. He found Mr. Abbott with a complete outfit and making his own tile in large quantities and on his return reported the matter to me. In the autumn, in order that I might have some information from the practical side, as well as from our own laboratory tests, I wrote Mr. Abbott asking him a long list of questions which he very kindly answered. I give the questions and answers below:

1. Q. What did your machine cost? A. My machine is a London and cost $170 with four outfits and 100 pallets.

2. Q. For what sizes is it equipped? A. Eight inch, six inch, four inch and three inch.

3. Q. What number of pallets of each size, and the cost thereof? A. 20 8-inch, 30 6-inch, 30 4-inch, and 20 3-inch. All pallets cost 50 cents each.

4. Q. What preparation in the way of platform, shelter, etc., did you make, and what was the cost thereof? A. I made a platform 10 ft. by 14 ft. of brick laid flat on the ground on which I mix the concrete and operate the machine. All the shelter required is something to keep the sun off while you are working. I used a tent cover which I happened to have. I made racks

to hold pallets while tile are curing sufficient to hold 100 pallets by setting posts 2 ft. apart and 2 ft. above ground and nailed boards on inside along the top. This saves a lot of stooping work and keeps the tile from being broken while green. The most essential part is to have a good supply of water elevated enough to sprinkle through a hose. For this purpose I used three barrels connected together by means of short pieces of hose and placed on platform 8 ft. high and forced the water with a windmill. The cost of my plant did not exceed $25.00.

5. Q. What strength do you make your mortar? A. Seven parts sand to one of cement.

6. Q. How many complete 3-inch tile can you make from one bag of cement? A. I cannot tell exactly as I have not pallets enough to test it, but I think about 125.*

7. Q.—What does your cement cost? A.—$2.00 per barrel.

8. Q.—The cost of your sand? A.—I used mostly pit gravel sifted, which cost 15 cents per load at the pit. I also used lake or beach sand, which I like better, but it was too heavy to haul.

9. Q.—What number of men do you find economical to operate the outfit? A.—Two, one to mould and the other to wait on him.

10. Q.—The cost of labour per day? A.—$1.00 with board.

11. Q.—How many 3-inch tile per day can your men make if working steadily on that size? A.—600.

12. Q.—What is your estimate of the cost of your tile compared with the cost of clay tile? A.—Two-thirds to three-quarters the price of clay tile.†

Before leaving the subject of cement tile, I should like to say that while the question of durability of cement drain tile is being settled, and while cement tile machinery is being perfected, it might be as well for Ontario farmers to go slowly in the matter of adopting cement tile.

Drainage Law.

This year as in the past several drainage disputes have come to our notice, through correspondence and otherwise. Almost invariably these arise from ignorance of the Ditches and Watercourses Act or from a deliberate determination to disregard the rights of others and "bluff" those wanting the drainage into abandoning the proposed ditch rather than "go to law" to force an outlet, or into constructing the ditch themselves rather than try to compel those "up stream" to come down and pay their just share for outlet privileges. For instance, one man declared "I won't let a drain go through here if it costs the farm." If it is the natural course of the water he might as well try to fly as to prevent the drain being built, or escape paying his share, if it benefits his land, if the proper steps are taken to force the outlet. Only a person ignorant of the law or deliberately unjust and stubborn would make such a declaration. It is equally futile and unfair for a man living up stream to declare that he will not assist with the outlet, provided he lives within statutory distance of the sides or point of commencement of the drain.

Amendments to Ditches and Watercourses Act.

In this connection it may be wise to draw attention to what that distance is. Up till last session of the Legislature the owner of any lands lying

* The estimate of 125 is probably a little high. At 6 parts of sand to one of cement we made 78 tile from one bag, and at 7 to 1 the number would be approximately one-sixth more, or 91.

† This estimate does not differ greatly from the calculation made on the prices at Belgrave.

"within 75 rods of the sides or point of commencement of the drain" and which land drained into that course could in case an engineer was "brought on" be assessed for outlet benefit. (R.S.O. ch. 285, sec. 6 (1)). The Legislature of 1908, however, amended this section to read 150 rods instead of 75, so that now any owner having land within approximately half a mile of the sides or point of commencement of a drain may be assessed for the construction of the same if this land slopes toward the drain. This, I believe, to be an improvement in the Act, for in many cases 75 rods was insufficient to do justice to all concerned.

Defect in Ditches and Watercourses Act.

There is another glaring defect in the Ditches and Watercourses Act, viz., that an engineer is not compelled to make a report if he finds the drain unnecessary. Section 16 (1) of the Act reads: "..... *and if he finds that the ditch is required*, he shall ..... make his award....." In no part of the Act is he instructed what to do in case he finds that the ditch is not required. This leaves a beautiful "loop-hole" for unscrupulous neighbours and engineers, if such there should be. From the engineer's standpoint there is an equally objectionable feature related to this, viz.: if he does not make an award the Act provides no means whereby he can collect his fees for the time spent. In the possible case alluded to above this would not be serious for it would be an easy matter for unscrupulous men interested in blocking the proceedings to see that the engineer did not lose by finding that "the ditch is not required." But there are cases, and I know of such, where in all honesty after a preliminary survey the engineer finds that for some reason the ditch cannot be proceeded with. He makes no award because he cannot, nor any report, for the Act does not call for one. The petitioner is dissatisfied because his ditch is being held up without apparent reason, or may be he thinks some underhand work is being done, while the engineer has a grievance in that he has been caused a considerable loss in time and possibly in money (for livery and assistant may be) with no provision for his reimbursement. It seems to me therefore that the Act should be amended in these two particulars: (1) Should the engineer find that the ditch is not required he should be bound to bring in a report to that effect, the party concerned being given the right of appeal against such report as against an award; (2) Provision should be made for the payment of the engineer's fees in case of a report as in case of an award.

Financial Assistance in Under Drainage.

Frequently we meet men whose land needs underdrainage very badly, and who because of scant crops given by the over-wet land are not financially in a position to underdrain, much as they would like to. For the assistance of such, provision has been made in the Tile, Stone and Timber Drainage Act (R.S.O., chap. 41). By this Act any municipality in Ontario is empowered to borrow from the Consolidated Revenue Fund of the Province for drainage purposes sums of money ranging from $2,000 to $10,000. It is further empowered to lend this money out to farmers at 4% compound interest in sums ranging from $100 to $1,000 to any one man in $100 lots (no fractions) to be used in draining their land by tile, stone, or timber drains. The township may borrow not less than $2,000 for these purposes, and may lend not more than $1,000 to one man, hence two or more farmers must apply before the council can proceed. The money is to be repaid to the township in twenty equal annual payments of $7.36 for each $100 borrowed. To gain

a better idea of what this charge would mean to the land drained we may reason as follows: $100 will on the average pay for the drainage of about 5 acres of land, hiring everything done. The charge per year would be $7.36 on five acres or $1.47 per year on one acre. Now if the drainage increased the crop only 10%, a very low estimate, that on a crop of wheat would mean 2 bushels per acre, and this would pay the $1.47. As a matter of experience by hundreds of farmers who have drained extensively we are able to state that the increase in crop is much more than 10%, enough indeed, to pay the entire cost of drainage in from two to three years (three years is the longest estimate I have had from any of those whom we have interrogated on this point). Such being the case would it not be good business for any man who wants to drain but hasn't the capital to find some one or more others in a like position and they together make application to the council for loans under the Tile, Stone and Timber Drainage Act? The first man for whom the writer did drainage surveying was a man who had some years earlier availed himself of the aid offered by this Act, and he was enthusiastic in advocating such action. He is a man who with little capital bought a wet farm in one of the best of the many good districts of Ontario, and who as almost a first step drained it as indicated. To-day he is well-to-do.

Investigations.

Under this heading we have no work of our own to report. The drainage proposition seemed so important and the time seemed so opportune for an energetic prosecution of the campaign to spread throughout the Province a more general knowledge of farm drainage operations that our research work in poultry, evaporation, transpiration, soil moisture and soil aeration have been sacrificed for the time being. This we regret very much; we believe these various problems are important and we submit that our staff should be increased by one man in order that we may follow up these investigations. But while we have no investigations of our own upon which to report, some thesis work has been done under our supervision that we deem highly important, and upon which we have prepared reports. One of these has already been referred to, viz.: the cost of making cement tile. The other is that of ventilation, a report of which follows.

Muslin Curtain Ventilation vs. Massey System and King System.

Owing to the general discussion of the Muslin Curtain system of ventilation and the lack of definite information regarding the same, it was deemed advisable to conduct an investigation into the relative merits of this and the systems already in use at the College. It was the original intention to have this work done by one of the staff of the department, but it was seen in advance to entail a great amount of labor at a time when the department was already taxed beyond its limit with teaching duties. Hence it was turned over to Messrs. H. Sirett and H. C. Duff for thesis work under the close supervision of the department of Physics.

It was intended to start the work January 1st, but it was found that the Christmas holidays, although occupied largely in preparation, were not sufficiently long to have everything ready. Besides getting the curtains in readiness these men made a careful study of gas analysis, in so far as carbon dioxide determination is concerned, so that it was the end of January before actual observations were begun.

There are two cattle stables at the College, the "farm" stable in the main barn, and the "dairy" stable at the dairy barn. The former, which has since been remodelled, was originally ventilated by a modification of

the Massey system. Cowls above the peak, always turning their open side toward the wind except it was a gentle one, provided the intakes for the fresh air. From them large flues led down to the stable beneath, one for each feed passage between two rows of cattle, and dividing into two branches along the manger on each side of the passage, with a 3 inch auger hole in front of each stall. Thus, when fresh air came down the flue, a portion of it was discharged from each hole, each animal then getting its fair share. The foul air was supposed to be discharged from the ceiling through outlet flues which led up into the body of the barn. There were two outlets, and two inlets branching to four. The system did not prove at all times reliable, for frequently the intended inlets were found by actual test to be outlets and the air movement in the intended outlets was always sluggish. But such as it was we decided to test it against the muslin curtain system.

The dairy stable was and still is ventilated by the "King" system. The intake for the fresh air is near the ground, but instead of the air being admitted at this level it is led up inside the wall to the ceiling through inch-board flues, about 8 inches by 10 inches, some of which open into the stable at the side wall, while others continue along the ceiling to the centre before opening into it. All the fresh air is thus admitted at the ceiling, whence it sinks to the floor, distributing to all parts as it does so. The outlet flues are also at the side walls. Beginning at the floor they pass up the wall through the ceiling to the eaves, whence they run along beneath the roof to the peak where in twos (one from each side) they unite in small ventilators through the roof. Down in the stable most of the outlet flues are provided with two openings, one near the floor and the other at the ceiling, each having a door, so that the outgoing foul air may be drawn from the floor or ceiling as desired. There are 6 inlets and 8 outlets, 5 of the outlets extending to the floor. Consulting the tables which follow, the reader will observe that in both stables the air at the ceiling was always from 3 to 5 degrees warmer than that at the floor. Hence the purpose of the two outlets in the King system is obvious. During moderate or mild weather, when the stable is likely to become too warm the ceiling outlets may be used, the warm air drawn off and overheating prevented. In severe weather when the stable is likely to become too cool, the floor outlets may be used, the cold air is drawn off, and the proper temperature again maintained. Usually the floor outlets were used.

In summing up the systems, then, they are as follows:

Farm stable, Massey system, fresh air admitted at floor; foul air drawn from ceiling. Dairy stable, King system, fresh air admitted at ceiling, sinks to floor; foul air drawn off at ceiling in mild weather, at floor in severe weather. Thus in mild weather the two systems are similar in principle, though differing somewhat in details. In severe weather the systems are directly opposite in principle.

The farm stable was 126 x 52 x 10½ feet, and contained 45 cattle, thus having 1,550 cubic feet of space per head. The dairy stable was 120½ feet x 38 feet x 8½ feet. It contained 38 cattle, each thus having 1,024 cubic feet of space. Hence it will be seen that the dairy stable afforded only two-thirds as much room per animal as did the farm stable. The latter had 12 windows on the south-east side, half double sash, one part of which could be slid sidewise thus leaving the window half open. All were covered with cheapest cotton ("muslin curtain"). The dairy stable had two windows on the south-east side, ten on the north-west, one on the north-east end and two on the south-west, making 14 altogether. Of these 7 were fitted with muslin curtain, 4 on north-west, 1 on south-east, and 2 on south-west,

They were hinged at the bottom, and could be opened little or much as desired. When partly open they directed the incoming air upward.

It was the plan of the experiment to test first the systems already installed in the stables and then to close the inlets and outlets and open part or all of the windows covered with the muslin curtain and test the muslin curtain system. The ultimate test of the efficiency of any system is the degree of purity of the air in the stable. And since the purity or impurity of air vitiated by breathing is generally stated in terms of its carbon dioxide content we decided to adopt that as one standard of comparison, and throughout the months of February and March, 1908, carbon dioxide readings were taken at the floor and ceiling and occasionally part way between. The relative humidity, i.e., the amount of moisture in the air in terms of its total moisture capacity at that temperature, was also read at the floor and ceiling. In adition to these data the maximum and minimum temperatures for the night both outside and in the stable were observed; also the floor and ceiling temperatures at the time the carbon dioxide determinations were made, all "floor" readings being interpreted to mean level with cattle's nostrils (average position). But our information would not be complete without one more factor. It is known that the wind exerts a potent influence on ventilation, and in order to have accurate determinations a complete wind-recording outfit was installed. From the daily records of this "anemometer" we are able to tell for any minute in the day the direction of the wind and its velocity in miles per hour. Consulting the records these facts for the times at which readings were taken have been entered in the tables.

One other test was made, the readings for which are not here recorded. The velocity of the air in the inlets and outlets was frequently measured, the instrument used being a delicate anemometer, so delicate indeed that at a distance of twelve feet its wheel can be made to turn by a person blowing at it. This delicate instrument was placed in the flue where air current was to be measured. In calm weather the movement of air through the muslin curtain was never sufficient to affect the anemometer, though with a very strong wind blowing perpendicularly or nearly so on the muslin the air came through at the bottom of the curtain with sufficient speed to turn the wheel slowly. In the King system there were always strong blasts coming in and others going out. In the Massey system the movement through the "outlets" was only sufficient at the greatest to turn the wheel very slowly, sometimes not at all. In the "inlets" which sometimes acted as such and sometimes as outlets and sometimes alternated every few minutes, the movement was usually rapid. These readings would seem to indicate that it is not a good plan to have the "outlets" open into the body of the barn, but that they should be continued above the roof.

Where there are so many people going in and out of stables as there are here it is only at night that ventilation systems can be properly tested, and so readings were always taken at night, being begun from 9 to 10 p.m. as a rule and frequently continued till midnight and occasionally later, for carbon dioxide determination is a slow process. For each stable the observations were taken about 25 nights. Mr. Sirett was in charge at the main barn and Mr. Duff at the dairy barn.

Table X gives the data for the farm stable. Looking first at the carbon dioxide content, we see that in the first test of the Massey system there were at the floor 11.1 parts of carbon dioxide by volume in 10,000 volumes of air; at the ceiling 15.4 parts. Air in its "pure" state contains about 3.3 parts per 10,000. The readings during this test seem very irregular, sometimes high and sometimes low. In one point five out of the six readings agree, viz: shewing more CO_2 (carbon dioxide) at the ceiling than

TABLE X.

System.	Date (1908).	Wind.		Temperature.							Humidity		Carbon Dioxide.		Adjustments.			Remarks.
				For night.				At time of reading.					Volumes in 10,000 volumes air.		Massey.		Muslin Curtain.	
				Outside.		Inside.		Outside.	Inside.									
		Direction.	Velocity—Miles per hour.	Max.	Min.	Max.	Min.		Floor.	Ceiling.	Floor.	Ceiling.	Floor.	Ceiling.	4 ceiling outlets.	4 floor inlets.	Windows in use.	
Massey System.. First Test.	Jan. 30	.....	Str.	8.0	-2.0	Maximum and minimum readings taken six feet from floor.		....	32.5	....	95.7	....	13.3	21.2	open	cl's'd	.....	Inlets packed with straw.
	" 31	.....	.....	20 0	12.0			20.0	34.0	....	79 2	....	17.8	23.4	"	"	.....	Inlets packed with straw.
	Feb. 1	N.E.	.....	28.0	24.0			12.0	39.0	....	81.6	....	.....	.....	"	open	.....	Whenever tested with the anemometer the outlets showed little air movement and inlets showed erratic movement.
	" 3	.....	C.	8.0	-19.0			-5.0	36.0	....	80.2	....	7.8	5.6	"	"		
	" 4	.....	C.	12.0	-11.0			-10.0	28.0	....	88.0	....	13.4	25.7	"	"		
	" 5	N.E.	Str.	27.0	16.0			27.0	35.0	....	83.5	....	7.3	7.8	"	"		
	" 6	.....	Str.	25.0	11 0			12.0	37.5	....	86.0	....	6.7	8.9	"	"		
	Averages ..	.....	.....	18.3	4.4			9.3	34.6	....	84.9	....	11.1	15.4	.....	.....		
Muslin Curtain .. First Test.	Feb. 13	.....	Str.	38.0	35.0			36.7	50.0	....	92.7	....	16.7	21.2	.....	.....	6	Windows 44 in. x 26 in. all on S.E.
	" 14	.....	.....	36.0	28.0			33.0	48.5	....	88.9	....	.....	.....	.....	.....	.....	Windows sheltered on east and west by wings of stable.
	" 15	E.	9	18.0	13.0			21.7	47.5	....	88.6	....	16.2	14.5	.....	.....		
	" 17	E.	6	17.0	16 0			10.0	42.0	....	91.4	....	.....	.....	.....	.....	.....	Odor.
	" 18	N.E.	17	14.0	10.0			20.5	40.5	....	82.2	....	14.5	17.8	.....	.....	.....	Odor
	Averages ..	.....	.....	24.6	20.4			24.4	45.7	....	88.8	....	15.8	18.2	.....	.....		
Massey System.. Second Test.	Mar 5	E.	21	38.0	36.0	48.0	42.0	....	42.5	....	78.9	....	10.6	11.2	open	open		
	" 6	S.W.	40	38.0	33.0	46.0	45.0	....	44.0	....	75.6	....	6.1	7.2	"	"		
	" 7	S.W.	10	36.0	28.0	48.0	46.0	....	45.1	49.6	76.8	82.7	6.7	9.5	"	"		
	" 9	S.	10	33.0	23.0	45.0	42.0	....	41.2	45.9	85.9	84.9	6.7	8.9	"	"	.....	Inlets all acting as outlets.
	" 11	S.W.	6	37.0	32.0	50.0	48.0	....	45.2	50.2	90.5	82.9	5.6	8.4	"	"	.....	Inlets erratic.
	" 12	E	8	40.0	34.0	52.0	49.0	....	46.4	52.8	89.1	78.4	7.3	7.8	"	"	.....	Inlets 1 and 2 acting as outlets.
	" 14	S.W.	17	35.0	26.0	56.0	41.0	....	49.8	53.6	88.4	84.0	7.3	9 5	"	"	.....	Inlets 3 and 4 acting as inlets.
	Averages ..	.....	16	36.7	30 3	49.3	44.7	....	*45.4	50.4	*86.1	82.6	7.2	8.9	.....	.....	Odor.	Inlets 3 and 4 acting as outlets. Inlets 1 and 2 acting as inlets.
Muslin Curtain.. Second Test.	Mar. 16	N.	4	32.0	21.0	47.0	41.0	....	45.6	49.0	85.8	82.5	7.8	11.2	.....	.....	12	6 windows 45 in. x 26 in. and 6 other 50 in. x 26 in. all fitted with muslin and open on S.E.
	" 18	N E.	12	31.0	27.0	50.0	48.0	....	47.0	50.2	93.9	80 0	7.8	7.8	.....	.....		
	" 19	S.W.	7	33.0	25.0	51.0	50.0	....	48.2	50.6	89.6	92.8	10.6	9.5	.....	.....		
	" 20	S.W.	7	31 0	24.0	52.0	46.0	....	49.2	52.8	91.2	86.3	16.7	12.8	.....	... .	.....	Windows sheltered on east and west by wings of stable.
	" 21	S.W.	15	34.0	32.0	52.0	46.0	....	49.0	53.8	85.3	79 7	8.4	9.5	.....	.....		
	" 23	S.W.	11	33.0	30.0	56.0	51.0	. ..	54.2	57.8	90.7	86.4	12.8	13.4	.....	.....	Odor .	
	Averages ..	.....	9.3	32.3	26.5	51.3	47.0	....	48.8	52.4	89.4	84.6	10.7	10.7	.....	... .		
Averages: Massey	.....	.....	.....	*36.7	30 3	*49.3	44.7	....	*45.5	50.4	*86.1	82.6	9.0	11.9	.....	.....		
Muslin Curtain..	.....	.....	.....	32.3	26.5	51.3	47.0	....	48.8	52.4	89.4	84.6	12.4	13.2	.....	.....		

* In case of related readings, *e.g.*, "maximum and minimum" or "floor and ceiling," the averages include only the observations when both readings of the pair were taken.

C, Calm ; Str., Strong.

at the floor. They were taken during the latter part of a very cold spell during which some difficulty was experienced in keeping the stable temperature above freezing, so much so that for some time previous to the beginning of the test the inlets were packed with straw. This was removed after a few days. It may be explained here, too, that no effort was made by the experimenters to regulate the Massey or King systems. They were tested as in ordinary use by the herdsmen at the respective barns.

Coming to the first test of the Muslin Curtain system in the same stable, with six windows curtained, (96 square feet of curtain) we observe that the averages shew much higher CO_2 content than with the Massey, the greater quantity being at the ceiling as in the Massey, though one of the three individual readings shews more at the floor. The "floor" readings are pretty uniform.

Coming to the second test of the Massey system we find a beautifully uniform set of readings, and all shewing greater carbon dioxide content at the ceiling than at the floor, the amount at the latter being slightly greater than twice the amount in "pure" air. Throughout the test the CO_2 was low. The average wind velocity at the time of reading was high, viz. 16 miles per hour.

In the second Muslin Curtain test with 12 windows curtained, we again see more CO_2 than in the second Massey test, though not so much as in the first Massey test. We see a considerable variation in these readings, but if we look at the wind velocities we find that in most cases the quantities of CO_2 at the floor vary with the wind. Two of the six readings shew the more CO_2 at the floor, three more at the ceiling, and one the same for both, the average being exactly the same for both floor and ceiling. So far as carbon dioxide is concerned more value is placed upon the second test than upon the first, in which the working of the Massey system was somewhat disturbed.

Averaging the readings of both tests we find that at the floor which, as previously explained, means on a level with the average position of the cattle's nostrils and which is therefore the more important, the Massey system gives 9 parts of CO_2 per 10,000 volumes of air and the Muslin Curtain 12.4 parts, the latter being an increase of 37.7 per cent. over the former. In the Massey system the greater quantities of CO_2 are at the ceiling. In the Muslin Curtain the first test also shewed greater CO_2 at the ceiling, but the other test shewed an even distribution, the same at the floor as at the ceiling.

The humidity readings are worth noting. In each test the Muslin Curtain increased the humidity, and all readings are very high, even though the CO_2 content may be low. The stable is thus a damp one, 86.1 per cent. humidity at the floor when ventilated by the Massey system and 89.4 per cent. with the Muslin Curtain. The humidity is greater at the floor than at the ceiling in both systems.

The maximum and minimum temperatures were taken during the second test. Average range for night with Massey system 4.6 degrees. greatest range 15 degrees. The Muslin Curtain gave an average range of 4.3 degrees and a greatest range of 15 degrees. The Muslin averages are the higher in all cases. All the curtained windows were on the south-east side, and the wind was never such as to blow with much strength upon them.

Table XI gives the results for the dairy stable. In the first test the CO_2 readings are pretty uniform with the exception of one at the ceiling, all ceiling readings being greater than corresponding floor readings. What variations occur in the floor readings go with the wind.

TABLE XI.

System.	Date (1908).	Wind.		Temperature.								Humidity.		Carbon Dioxide.			Adjustments.						Remarks.
				For night.				At time of reading.						Volumes in 10,000 volumes air.			King.			Mus. Curtain.			
				Outside.		Inside.		Outside.	Inside.											Curtained windows in use.			
		Direction.	Velocity—Miles per hour.	Max.	Min.	Max. †	Min. †		Floor.	Half-way.	Ceiling.	Floor.	Ceiling.	Floor.	Half-way.	Ceiling.	5 floor outlets.	8 ceiling outlets.	6 inlets.	N.W.	N.E.	S.E.	
King System 1st Test.	Feb. 3...	N.E.	Li.	8.0	-19.0	56.0	53.0	-5.0	50.0	....	53.0	85.6	.....	13.3	....	13.3	open	cl's'd	1 partially open				
	" 4...	.....	C.	12.0	-11.0	54.0	46.0	-11.0	47.0	....	50.0	77.2	.....	10.0	....	13.3	"	"					
	" 5...	.....	C.	27.0	16.0	52.0	46.0	20.5	46.0	....	49.0	78.1	.....	11.1	....	20.0	"	"					
	" 6...	S.W.	Str.	25.0	11.0	56.0	52.0	16.0	53.0	....	55.0	79.8	80.5	10.0	....	13.3	"	"	lop'n				
	" 7...	N.W.	Li.	18.0	-7.0	56.0	52.0	7.0	50.0	....	53.0	78.6	79.8	11.1	....	13.3	"	"					
	" 8...	N.W.	Li.	14.0	-2.0	55.0	49.0	-7.0	48.0	....	51.0	70.4	72.2	10.0	....	12.2	"	"					
	Averages	.....	....	17.3	-2.0	54.8	49.7	3.4	49.0	...	51.8	*76.3	*77.5	10.9	....	14.2							
Muslin Curtain 1st Test.	Feb. 10...	S.	Li.	25.0	12.0	56.0	50.0	19.0	55.0	....	57.0	80.5	80.9	22.2	....	17.8	.....	.....	.....	2	...	1	Strong Odor.
	" 11...	.....	Li.	28.0	25.0	59.0	53.0	28.0	57.0	....	60.0	75.2	82.2	23.4	....	.....	.....	.....	.....	4	....	1	Strong Odor.
	" 12...	.....	Str.	30.0	29.0	59.0	53.0	35.0	54.0	....	58.0	73.8	69.8	13.3	....	.....	.....	.....	.....	4	....	1	Odor.
	" 13...	.....	Irr.	38.0	35.0	62.0	58.0	37.0	58.0	....	61.0	75.6	82.5	18.8	....	.....	.....	.....	.....	4	....	1	Irregular current
	" 15...	E.	9	18.0	13.0	63.0	48.0	23.0	48.0	....	51.0	77.2	79.0	13.3	....	.....	.....	.....	.....	4	....	1	of air through
	" 17...	.....	6	17.0	16.0	59.0	51.0	11.0	50.0	....	55.0	85.6	80.5	18.8	....	24.0	.....	.....	.....	4	....	1	curtains.
	Averages	.....	....	26.0	21.6	59.6	52.2	25.5	53.6	....	57.0	77.9	79.2	18.3	....	.....							
														*20.5	....	*20.9							
King System 2nd Test.	Mar. 3...	N.W.	9	21.0	17.0	58.0	55.0	18.0	55.0	58.0	60.0	74.3	70.8	17.8	....	20.2	open	lop'n	2 completely and 1 partially open.				
	" 5...	S.E.	18	38.0	36.0	59.0	55.0	26.0	57.0	59.0	62.0	75.2	77.2	14.5	16.7	17.8	"	"	"				
	" 6...	W.	40	38.0	33.0	59.0	54.0	38.0	59.0	60.0	62.0	70.3	77.2	11.1	14.4	15.6	"	"	"				
	" 7...	S.W.	11	30.0	28.0	59.0	53.0	31.0	60.0	....	‡(64)	.....	.....	18.8	....	‡(22.1)	"						
	Averages	.....	19.5	32.3	28.5	58.8	54.3	28.3	57.8	59.0	62.0	73.3	75.1	15.5	....	18.9							
Muslin Curtain 2nd Test.	Mar. 9...	.....	1	33.0	22.0	60.0	54.0	18.0	54.0	56.0	58.0	67.4	69.8	24.4	20.0	18.8	.....	.....	.....	4	1	1	
	" 10...	S.W.	6	36.0	28.0	57.0	50.0	25.0	55.0	57.0	58.0	74.3	75.6	13.3	....	10.0	.....	.....	.....	4	1	2	
	" 11...	S.W.	8	37.0	32.0	63.0	54.0	32.0	57.0	61.0	63.0	75.2	72.3	14.4	14.4	11.1	.....	.....	.....	4	1	1	
	" 12...	N.E.	12	40.0	34.0	61.5	53.0	34.0	57.0	59.0	61.0	69.2	65.9	12.2	11.1	8.9	.....	.....	.....	4	1	2	
	" 14...	S.W.	9–17	35.0	26.0	63.0	58.0	39.0	58.0	62.0	64.0	76.1	72.7	24.4	....	12.2	.....	.....	.....	4	1	2	
	Averages	.....	8.0	36.2	28.4	60.9	53.8	29.6	56.2	59.0	60.8	72.4	71.3	17.7	....	12.2							
Averages : King....	.....	.....	....	23.3	10.7	56.5	51.6	13 4	52.4	....	55 7	*74.8	*76.3	*12.7	....	*15.9							
Mus. Cur.	.....	.....	....	30.6	24.7	60.2	52.9	27.4	54.8	....	58.7	75.4	75.6	*18.5	....	14.7							

† Maximum and minimum readings in stable taken half way between ceiling and floor.
‡ Figures in brackets are interpolations based on general averages.
* In case of related readings, *e.g.*, "maximum and minimum" or "floor and ceiling," the averages include only the observations when both readings of the pair were taken.
C, Calm; Li., Light; Str., Strong; Irr., Irregular.

The first Muslin Curtain test shews CO_2 variations with the wind. Only two ceiling readings were taken, one being less than the corresponding floor reading and the other greater. Averaging the floor and ceiling readings for these two nights we have 20.5 and 20.9, pretty nearly the same.

The second test of the King system also shews variations with the wind, ceiling readings being uniformily higher than floor readings, the averages differing by practically the same amount as in the first test.

The Muslin Curtain in the second test shews a different distribution of the carbon dioxide, the floor amounts being largely in excess in all readings. There are certain variations for which no reason is apparent. Averaging floor and ceiling readings for all nights on which both were taken we find the floor averages to be 12.7 for the King system and 18.5 for the Muslin Curtain system, the latter being an increase of 43.4 per cent. over the former. We also see that on the average the distribtuion of the CO_2 for the two systems is directly opposite.

At this stage the mind involuntarily makes a comparison: 9 parts of carbon dioxide at the floor by the Massey system and 12.7 by the King system, the latter being 41.1 per cent. greater than the former. Yet in spite of this a person going into the two stables on the same night and judging by his sensations would say that the dairy stable was the better ventilated—and may be it was, for carbon dioxide is not the only impurity in stables.

Consulting the "humidity" columns of Table II we find for the King system an average humidity of 74.8 at the floor and 76.3 at the ceiling. Another comparison: Humidity at the floor by Massey system 86.1, by the King 74.8, and we have an explanation of the difference in sensations on entering the different stables. The air in the farm stable was much more humid than that in the dairy stable, a difference possibly explained by the fact that the former is a stone stable but the latter a frame.

The range of temperatures during the night in the dairy stable was nearly twice as great for the Muslin Curtain system as for the King, and in both systems the stable was much warmer than the farm stable. Had the King system been so regulated as to keep the stable about five degrees cooler the carbon dioxide content would have been lowered. What effect it would have had on the humidity is problematic.

In summing up we cannot regard the Muslin Curtain system as measuring up the requirements of even a fairly effective system of ventilation. It is irregular, uncertain and ineffective in action, the two tests in each stable shewing different distributions of carbon dioxide and moisture, and more of both than by the other system for that stable. In the King and the Massey each was consistent with itself, shewing always the same relative distribution of CO_2 and moisture. Hence we must judge the Muslin Curtain system as unreliable and inferior to both the systems against which it has been tested. The comparison is a fair one for in each case the same stable was ventilated by the systems compared. On the other hand, a comparison of the Massey and King systems from these data would not be fair, for they were tested in different stables with different conditions of elevation, exposure and stable structure, with different amounts of stable room per head of stock, the one for a mixed herd of growing and fattening cattle, the other for a herd of milch cows for which a warmer stable is usually desired, and lastly under the management of different herdsmen.

Respectfully submitted,

WM. H. DAY.

PART VI.

THE PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College:

SIR,—In submitting my report for the year 1908, I wish to thank you for allowing me six months' leave of absence to visit some of the European chemical laboratories. I spent a very interesting and profitable summer, and had the privilege of meeting many chemists of renown in their own laboratories and observing their methods of investigating the intricate problems which are continually being brought to the attention of the agricultural chemist. I also had an opportunity of observing some of the methods of cultivation employed in the intensive farming of these older countries.

Among the most interesting places visited on the continent were Berlin and the district lying about Leipzig and Halle. In these places I met Dr. Zuntz and Dr. Kellner, two men whose work on animal nutrition has materially aided in placing cattle feeding on a good sound scientific basis. I visited the laboratories and experimental grounds at Bernburg and Lauchstadt, where the late Dr. Hellriegel and Dr. Maercher did their pioneer work on soil investigations, and where their worthy successors, Dr. Weismer and Dr. Schneiderwind, are continuing the work. I also visited the Saxony Fruit Experiment Station at Deimetz, and at Halle had a chance to see Dr. Wohlmann's experimental grounds and his large collection of wild and domestic animals which are being used in an attempt to develop superior types of domestic animals. In this district I also had an opportunity of going over several farms, one of which contained 2,000 acres and one fruit farm of 600 acres, and was thus able to see something of the methods of cultivation practised.

In England, I spent some time with Prof. Wood at Cambridge University and with Dr. Russell at Rothamsted, and visited several of the Agricultural Colleges of both England and Scotland, where I was always treated in the most cordial manner.

It was my pleasure to visit the National Exhibition at Prague, Austria; the Franco-British Exhibition at London; The Royal Agricultural Show at Newcastle-on-Tyne; the Highland Agricultural Show at Aberdeen, and the National Exhibition at Edinburgh, which afforded an excellent opportunity of seeing something of the agricultural possibilities of the several countries. I was also able to go over several large English and Scotch farms, where I was impressed with the thoroughness of the cultivation, and with the evident attention devoted to beautifying the home surroundings.

I am indeed deeply grateful to you for the privilege of visiting these places, and feel sure that the information gained, the acquaintances formed, and the enthusiasm aroused will greatly aid me in my College work.

The personnel of the staff of my department has remained unchanged during the year. The services of each member has been marked by a progressive efficiency that is encouraging. Prof. Gamble had charge of the work of the Department in my absence, and I wish to bear testimony to the able manner in which he discharged his duties.

One change in the arrangement of our work was made during the year. Mr. Gamble, who formerly taught the Inorganic Chemistry, Animal Chemistry, and Geology, has charge now of the Soil Chemistry in place of

the Animal Chemistry, and has been given the title of Professor of Soil Chemistry and Lecturer in Geology. He will also have charge of the investigation work with soils.

The work of instructing the students who attend the College from year to year forms the most important part of our work and consumes the major part of our time. It is, however, not necessary to outline the work here, as it may be found in the College Calendar and in former reports. The only change in the instruction work is that, owing to the growing importance of a thorough knowledge of remedies used in combatting the insect pests and fungus diseases, we have thought it advisable to give the specialists in Horticulture and Biology a fuller course of lectures with laboratory work on Insecticides and Fungicides. We also intend giving a course of lectures with laboratory work to the specialists in Horticulture on Chemistry in Relation to Vegetable and Fruits and the Canning Industry.

As usual a large part of my time is devoted to directing the work in the laboratories, answering letters of inquiry regarding many phases of farm work, writing articles for the agricultural papers and addressing farmers' meetings, and the conventions of Dairymen, Fruit Growers, Vegetable Growers, Millers, Bakers, etc. The time devoted to this work is continually increasing, and year after year consumes a larger proportion of my time.

A large number of samples of a great variety of substances have been examined during the year. The work done on some of these samples was small, while in other cases it was considerable. We are anxious to make the work of the department as useful as possible, and therefore, invite farmers and others interested in soils, manures, foods, dairy products, insecticides and fungicides, etc., to correspond with us. We cannot always make the analysis requested, partly because of the amount of work involved and partly because the sample sent has not been selected in such a way as to accurately represent the material of which it is a part; but we shall in all cases be pleased to give the fullest information we can.

INVESTIGATION WORK.

Swamp Soils.

In the spring of 1904, we commenced a study of the composition and peculiarities of Ontario Swamp Soils. Since then we have analysed nearly fifty samples of these soils and have done considerable experimental work with fertilizers to determine what effect the addition of the mineral plant food constituents has on the nature and yield of the crop. From time to time we have postponed the publication of the results until they could be further confirmed, and there are still several points on which we would like to get information, but we think that we have considerable data of an interesting and instructive character which might well be published in bulletin form. Therefore, we shall hold the detailed results, and report only a few of the general conclusions at this time.

According to the report of the Ontario Agricultural Commission, appointed in 1881, "to inquire into the agricultural resources of the Province of Ontario, the progress and condition of agriculture therein, and matters connected therewith," there was at that time a very large number of acres of what was known as swamp land. Almost every township is reported to have some such land, the estimated acreage varying from a few hundred to forty thousand acres or more. In the aggregate, there must have been hundreds of thousands of acres of these swamps.

Since that time many acres of swamp areas have been cleared and drained and are now being cropped more or less successfully. Where the swamp material lies over clay, and particularly if it is not too deep to allow some of the clayey materials to become mixed with the top soil, good results are usually obtained. When the materials are not sufficiently decomposed to form a soil that will hold water during the dry weather of the summer, or, when the subsoil is a sand, the results are invariably poor. This last type of soil usually produces fairly satisfactory crops during the first few years, but after the results are unsatisfactory. In so far as we were able to judge, however, these soils are not so common as the swamps over clay subsoils.

We collected and analysed forty-four samples of swamp soils from various parts of the province. The minimum, maximum and average results obtained from the air dried samples are as follows:

	Lowest	Highest	Average
Potash (K_2O)	.117	1.12	.426
Phosphoric acid (P_2O_5)	.12	.56	.281
Nitrogen (N)	.76	2.60	1.36
Lime (CaO)	.49	7.24	3.28

Out of the forty-four samples analysed only three contained less than one per cent. of lime and none of them were what might be called sour or acid. Eight of the samples contained less than 0.3 per cent. of potash and only six had less than 0.2 per cent. of phosphoric acid. In nearly every case the lowest percentage amounts of these plant food constituents were found in the swamp soils lying over a sandy subsoil. While these quantities of potash and phosphoric acid are not particularly large, there are many arable soils in Ontario producing good crops year after year which do not contain as much, and it is quite evident that the non-productiveness of some of these soils cannot be charged altogether to the lack of plant food.

These soils are naturally rich in nitrogen, but a very large proportion of it is held in an insoluble organic combination which is not available to plants. The results of the determinations of humus show that decomposition has proceeded further in some soils than in others, and it is quite possible that in many instances it does not take place rapidly enough to furnish a full supply of food to the plant. Some experiments which we have conducted in inoculating these soils with the ground germs by scattering a small amount of garden soil over the land, seem to indicate that decomposition can be hastened in this way and very much better results obtained. It also appears as though the good results commonly secured when farmyard manure is applied to these soils may be due to the same cause. In both cases, however, there is apt to be an over-abundance of nitrogen brought into an available condition and too rank growth of plant is produced.

The results obtained from the application of fertilizers have not been uniformly successful. This was doubtless due to the fact that some of the soils contained an abundance of the plant food constituents in an available form, and in other cases to insufficient drainage. In many instances, however, the crop was increased by fifty and one hundred per cent. by the application of potash or phosphoric acid, or the two together. Experiments were conducted with oats, corn and potatoes with muriate and sulphate of potash, superphosphate and Thomas phosphate, and with lime. Owing to the superphosphate being acid, Thomas phosphate appears to be the safer form of phosphoric acid to use. Lime has never given us appreciable results.

In general, it may be said that the first essential in bringing swamp soils into cultivation is good drainage, for none of our domestic plants can

make proper growth until the water held between the particles of soil is removed. Where the organic matter of the soil has not decomposed sufficiently to form a good firm soil, it is probable that inoculating by means of garden soil, or by the application of a light dressing of farmyard manure, will greatly hasten decomposition and thus liberate plant food and get rid of some of the excess of organic matter. Where the growth is fairly even, but small and wiry, manuring of some kind is necessary, and farmyard manure alone or, better, farmyard manure in small quantities and potash and phosphoric acid, have given good results. In many cases these soils are deficient in available potash and phosphoric acid, and the supplying of these alone is all that is necessary to put the soil into a condition that will make it productive.

Cattle Foods.

Mill By-Products. During recent years an ever-increasing number of mill by-products are being placed on the market. Many of these are rich enough in protein to be valuable as feeds to be fed along with the ordinary roughage of the farm, while others are so low in protein and high in crude fibre as to be almost worthless; and, further, the farmer is unfamiliar with the composition of them. We have, therefore, thought it our duty to study these feeds, and have analysed all samples sent to us by stock feeders. In Bulletin 138 we have given the composition of a large number of mill by-products, and in the following table we give the results of the analyses of a number of others, many of them entirely new products:

Name.	Moisture.	Protein.	Fat.	Fibre.	Nitrogen free extract.	Ash.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Wheat Bran	11.95	15.69	4.14	9.24	53.13	5.85
Wheat Middlings	12.30	15.81	4.22	4.16	60.19	3.42
Wheat Shorts	11.65	15.07	4.60	7.19	56.88	4.61
Cotton Seed Meal	8.51	43.63	13.37	5.51	22.03	7.05
Cotton Seed Hulls	11.80	4.18	2.01	46.61	32.91	2.59
Rice Bran	9.85	12.10	10.54	12.27	55.01	10.23
Rice Hulls	8.67	3.15	1.15	36.19	35.51	15.33
Rice Polish	10.10	12.11	7.21	3.25	62.17	5.16
Rice	12.44	7.42	0.51	0.21	78.95	0.47
Wheat	10.72	11.95	2.21	1.83	71.36	1.93
Barley	10.87	12.44	1.92	2.81	69.31	2.65
Oat Feed	7.82	15.21	6.68	6.51	59.86	3.92
Oat Dust	7.30	12.85	4.58	17.90	50.07	7.30
Oat Hulls	7.73	3.36	1.10	30.17	50.82	6.82
Gluten Meal	6.61	36.25	11.21	1.65	42.51	1.77
Germ Feed	5.25	13.64	8.10	16.00	56.11	.90
Rice Feed	9.17	12.24	11.89	11.46	46.65	8.59
Schumacher	12.75	12.31	2.64	9.76	59.55	3.08
Victor	13.10	9.91	1.78	10.71	61.02	3.48
Banner Feed	11.54	11.38	2.11	7.23	65.37	2.37
Rejected Oats	7.51	9 51	3.84	12.99	63.71	2.44
Frozen Wheat	9.36	15.43	2.63	2.68	67.88	2.02
Wheat Bran	8.88	13.18	3.07	12.22	57.13	5.42
National Chop	11.49	11.90	12.40	16.43	45.10	2.68
Dairy Chop	9.90	9.00	3.63	19.08	53.75	4.64
Hog Chop	11.40	8.69	3.64	12.09	60.93	3.25
Bran (adulterated) Sample A	9.55	10.62	4.55	13.94	56.24	5.10
Sample B	10.20	11.50	4.61	12.87	56.02	4.80
Soy Beans	11.70	14.98	4.87	22.15	39.14	7.16
Gluten Feed	8.37	16.32	6.11	6.34	59.65	1.21
Weed Seeds	9.60	13.81	2.60	11.90	54.63	7.46

Most of the feeds herein reported are by-products in the manufacture of flour, starch, glucose, and cereal foods, and, as such, are likely to show marked variation in composition, because of the different methods of manufacture employed. The feeding value, etc., of many of these has been treated of more or less fully in former bulletins and reports, therefore, it is not our purpose to dwell upon it at this time. There are, however, certain points relative to cotton seed meal, gluten meal, gluten feed, wheat bran, etc., which have not heretofore been touched upon. These we desire to draw attention to in a few short paragraphs.

Cotton Seed Meal. The importance of protein in concentrated feed stuffs is so well known as to require no particular comment. It will be observed that cotton seed meal contains a high percentage of this constituent. It might be considered, therefore, as one of the most desirable of all of the highly nitrogenous feeds, but experience has shown that such is not always the case. That it can be used as a useful component of a ration for milch cows is well known, that is, if the quantity fed be limited to two or three pounds per day. But the use of cotton seed meal in feeding pigs, sheep and horses has not given good results, and in a number of cases on record has been followed by the death of most of the animals in the course of a few months.

Cotton seed meal varies as much in composition as any of the by-products. The proteids may vary from 25 to 48 per cent. and the fat from 8 to 18. The bright yellow meals, which are comparatively free from ground hulls, are considered the best. But it would appear as though the color cannot be taken as a true indication of the value of these foods; for some of the cotton-seed is naturally lighter in color than others, and because of the prejudice in favor of the yellow colored articles, some of the manufacturers are now coloring their products to suit the demands of the market.

Gluten Meal and Gluten Feeds. A great deal of confusion exists as to the meaning of the different terms applied to these by-products from the manufacture of glucose. They are all derived from corn. The dry matter of the corn kernel contains nearly 75 per cent. of starch and 12 per cent. of protein. The starch is largely extracted from the corn for use in the manufacture of glucose, leaving a by-product rich in protein. The different products met with on the market and sold under the name of gluten meal and gluten feed are by-products obtained in the process of separating starch from the grain. The corn is first soaked in water for some hours, then coarsely ground and rubbed between mill stones, which remove the hulls and set free the starch cells. The material is then put on sieves of fine bolting cloth, and the starch and gluten pass through, while the germs and hulls remain on the sieves. The starch and gluten which go through the sieves are then forced through troughs or tanks of water and separated.

The hulls and germs of the corn remaining on the sieves are dried and placed on the market directly, or else treated with naphtha to remove most of the oil of the germs and are sold as gluten feed. The final residue obtained from the setting tanks, which is largely the gluten and oil of the corn, is dried and sold as cream gluten, or else the oil is extracted from it and the residue united with the germs and sold as gluten meal. Sometimes the corn hulls and germs are sold separately under the trade terms corn bran and germ meal; and not infrequently, as Mr. Shutt, Chemist of the Dominion Experimental Farm, has pointed out, the gluten feeds are retailed under the name of gluten meal. This is, of course, an impostion on the buyer, as the two materials are quite unlike, "gluten meal" being much the higher in protein content, as a glance at our table shows.

Some feeders are prejudiced against the use of gluten feeding stuffs, because of the belief that the sulphuric acid used in the manufacture of glucose affects the feeds. This prejudice is entirely unwarranted, as all of these by-products come directly from the corn by mechanical means of separation before the manufacture of glucose is begun.

The various gluten feeding stuffs have, in recent years, come into use very largely for feeding milch cows. They have been used with good results for increasing the quantity of milk, and the only objectionable effect noticed on butter has been a slightly softer texture. This may be overcome by using the gluten in connection with cotton seed meal. As previously mentioned, the chief difference in the composition of the glutens is the amount of protein, and their relative values can be estimated very closely by the percentages of this constituent contained in them. Gluten feeds, owing to the presence of corn hulls, contain considerably more fibre and starchy material and less protein than does gluten meal. The percentage of protein in gluten feed will vary from 12 to 24, and of fat from 8 to 11, while gluten meals contain from 22 to 35 per cent. of protein and 3 to 12 per cent. of fat.

Wheat Bran. This by-product consists of the outer covering of the wheat kernel when not ground, and is a bulky feed of great value for mixing with heavier grain feeds. The proportions of the various nutrients are so well balanced that it is one of the safest feeds and constitutes a portion of nearly every grain ration used by dairymen. Unfortunately, on account of the large demand for this feed, adulteration with oat hulls, etc., is now quite commonly practised. Wheat bran varies in protein from 14 to 17 per cent.

Wheat Middlings. This feed is supposed to consist of the covering of the wheat seeds just beneath the hulls, including a small part of the darker colored flour, but the fine middlings often include a part of the flour.

When but little flour is present, the middlings contain more protein than does wheat bran. The presence of flour does not add materially to its value.

Feeding Value of Frosted Wheat. Last winter there was a very large quantity of the frosted wheat from the western provinces sold in Ontario for cattle food. This was partly because there was more than the usual amount of frozen wheat in the west, and partly due to the scarcity of grain at home.

All the samples sent to our laboratory were of at least fair quality, and would probably grade No. 1 or No. 2 frozen wheat, but a few samples were brought to our notice which were so light as to be little better in appearance than good chaff. It is not wonderful, therefore, that there should be some conflicting opinions regarding the value of this material as cattle food.

Altogether we analysed twenty-seven samples of the frozen wheat, the results of which are given in the following table, together with the average results of the analysis of inferior, rusted, and frosted wheat raised in Minnesota, and normal hard wheat.

It is generally thought that protein is deposited in the kernel at a comparatively early stage in the development of the seed, and that the filling out of the grain with starch continues practically until the straw is exhausted. Consequently, it is not surprising to find that the protein in the shrunken, frosted wheat is higher, the starch lower, and the woody fibre of the bran layers greater than in the normal wheat.

Composition of Frozen Wheat.

	Moisture.	Protein.	Fat.	Soluble Carbohydrates.	Crude Fibre.	Ash.
1	12.20	12.16	1.61	69.70	2.85	1.48
2	11.65	12.92	1.58	69.80	2.41	1.64
3	11.49	11.85	1.71	70.54	2.91	1.50
4	10.42	15.25	1.25	67.20	3.13	1.75
5	12.05	11.29	1.38	72.21	1.86	1.21
6	9.37	13.56	2.20	70.97	2.47	1.43
7	11.48	10.36	2.16	71.67	3.08	1.25
8	9.09	13.36	1.73	71.94	2.89	.99
9	13.34	12.78	1.49	69.03	1.92	1.44
10	10.33	13.55	1.82	69.03	3.29	1.98
11	9.66	11 91	1.61	72.71	2.89	1.22
12	12.72	14.24	1.92	67.44	2.54	1.14
13	11.28	14.72	2.27	66.21	2.46	1.46
14	10.31	13.05	1.85	70.82	2.40	1.57
15	14.67	12.48	1.16	67.30	3.05	1.34
16	10 35	13.95	2.34	69.02	2.79	1.55
17	12.21	12.24	1.87	69.38	3.21	1.09
18	11.85	13.51	1.92	68.22	2.87	1.63
19	11.63	12.38	1.65	69.28	3.54	1.52
20	12.25	13.85	1.68	68.26	2.68	1.28
21	11.54	13.30	1.73	68.88	3.18	1.37
22	13.02	11.68	2.37	68.29	2.95	1.69
23	12.88	12.42	1.64	68.62	2.90	2.54
24	13.26	14.21	1.29	67.55	1.86	1.83
25	11.31	12.14	1.82	70.08	2.93	1.72
26	11.12	11.82	1.73	70.37	3.10	1.86
27	11.80	12.87	1.73	69.21	2.88	1.51
Maximum	14.67	15.25	2.37	72.71	3.54	2.54
Minimum	9.09	10.36	1.16	67.20	1.86	.99
Average	11.60	13.06	1.76	69.25	2.81	1.52
Wheat, inferior, rusted and frosted, raised in Minnesota.*						
Maximum	11.78	18.56	5.28	71.46	5.08	2.80
Minimum	8.42	13.38	1.99	61.46	1.10	1.06
Average	9.78	15.29	2.95	67.58	2.61	1.79
Normal wheat from Northern States. *						
Maximum	13.95	17.15	3.93	78.66	3.05	3.57
Minimum	7.10	8.05	1.26	64.84	0.44	0.80
Average	10.52	11.87	2.09	71.90	1.79	1.83

* A Compilation of Analyses of American Feeding Stuffs, Bulletin No. 11, Office of Experiment Stations.

The protein is the most valuable part of the food and the crude fibre the least; so that the higher protein of the frosted samples is more or less offset by the larger quantities of the undigestible fibre.

If we calculate the production values in terms of starch of these foods on the basis suggested by Warington in his book on the "Chemistry of the Farm," we find that 1,000 pounds of the frosted wheat we analysed, calculated from the average results, would give us a figure of 864, the Minnesota frosted wheat 897, and the normal wheat 886. Thus it will be seen that frosted wheat, such as we analysed, was but little inferior to the normal wheat in food value.

As mentioned before, all the frozen wheat sold in the province last winter would not come up to this standard, but when there is a fair weight and body to the wheat, it is safe to assume that it has considerable food value. So far as is known, the mere fact that it has been frozen detracts nothing from its food value.

Lime Sulphur Washes.

Commercial Lime Sulphur Solutions. The lime sulphur wash is now generally recognized as one of the most efficient of the orchard sprays. When properly made and applied, it has been found to be the best material for combatting the San José Scale, and, in addition, it is very effective in destroying other kinds of small insects, and it is also an efficient fungicide. It is true that varying results have been obtained from the use of this wash, but this is unquestionably due to either lack of care in making or lack of thoroughness in the application. Good washes cannot be made in a haphazard way, nor can they be efficient in destroying the scale if the spraying is not done thoroughly; for to kill, the spray must come in contact with the insect or fungus that is to be destroyed.

There is no particular difficulty in preparing the wash, provided the directions are followed closely, but, too often, owing to inexperience or neglect, it is not boiled enough and varying proportions of the sulphur are left uncombined, thus decreasing the efficiency of the wash.

Recently several brands of these lime-sulphur washes have been prepared commercially and offered for sale throughout the fruit districts. The work of preparing the wash is unpleasant and dirty and no doubt many fruit growers would be glad to use the commercial article, provided they were sure that the strength of the wash, diluted as directed, was satisfactory, and that the cost was reasonable. There is no reason why the commercial lime sulphur wash, or lime sulphur solution, as it is usually called, should not be a satisfactory strength. Unfortunately some of the manufacturers have over-estimated the strength of the preparation and have given directions for a greater dilution than the product will warrant if it is to be comparable with the home-made boiled preparation.

During the past season we analysed four samples of one particular brand of lime sulphur solution, which, according to the directions, was to be diluted with eleven parts of water to make it of suitable strength for a winter spray. The following table shows the weight of combined sulphur in the commercial solution, diluted as directed, compared with the amount found in the wash prepared by boiling 20 pounds of lime, and 15 pounds of sulphur in water for one-half hour and one hour and diluting to forty gallons.

Home-made wash boiled for one-half hour.....		153.5	grams per gallon.
" " " one hour		161.0	"
No. 1 Commercial sample		113.3	"
No. 2 "		56.3	"
No. 3 "		62.6	"
No. 4 "		92.4	"

It is thus evident that none of these commercial preparations, diluted eleven times as directed, would contain nearly as much combined sulphur as the home-made wash, even when only boiled one-half hour. To make them of the same strength as the one hour boiled wash, they could only be diluted 7.7, 3.9, 4.3, and 6.3 times, respectively. It will thus be seen that, if diluted as directed, the solutions will be very weak and inefficient, provided the home-made mixture is, as it stands, of proper strength, and, further, that if only sufficient water is added to bring them to the strength of the home-made wash, they will be much more expensive than the advertising matter would indicate.

A Study of Some Points in Connection with the Lime.

Sulphur Washes. During the season Mr. Fulmer has studied somewhat fully some phases of the lime sulphur washes on which we had no definite data. At my request he has prepared the following brief statement of the results. A fuller discussion of the methods employed and the results obtained in the work will be given in bulletin form after we have studied the whole subject more fully.

This insecticide is considered by orchardists to be the most valuable substance yet found for combatting the San José Scale. Judging from the great variety of practices followed and opinions held in regard to the making of the wash, however, there seems to be a lack of definite information as to some of the underlying principles. Some of these differences relate to the kind and quantity of materials to be used, others to the method of cooking and the length of time necessary for complete cooking, and others to various minor details in the process of making and applying. There is no doubt that washes of differing quality and effectiveness can be made, depending upon the differences above mentioned, and it was with the aim of trying to settle some of these points, and other points concerning which we frequently receive inquiries, that we spent some time during the past summer in the study of the lime sulphur wash.

Some facts are already known which aid greatly in such work. For instance, it is known that if lime and sulphur be mixed in water and heat applied, combination with the resulting formation of various compounds takes place; and that this combination proceeds under the control of certain definite chemical laws. Further, the various compounds which are formed are given names;—sulphides, thio-sulphates, sulphites, and sulphates, the properties of which are known, also the conditions necessary for their formation and the analytical methods which can be used for estimating them. The comparative insecticidal value of the compounds is also known. Thus, the sulphides are the most valuable, thio-sulphates come next, and the other two are of little or no use. Consequently, since the lime sulphur wash is a mixture of these four things (with various amounts of impurities and uncombined lime and sulphur), its value can be gauged when its proportion composition is determined and two washes can be compared, one with the other as to superiority.

It might also be well to state that the less valuable constituents of the wash, viz., thio-sulphates, sulphites, and sulphates, are formed as the result of the decomposition of the valuable sulphides. This transformation proceeds more rapidly while the wash is hot or boiling. Consequently long boiling, although absolutely necessary in order to get the maximum amount of lime and sulphur into combination as sulphide, results in the formation of appreciable amounts of these other constituents, while undue prolonged boiling increases these amounts still more causing a depreciation in the value of the wash.

Different kinds of Lime for making Sulphur Wash.

Three kinds of lime were used in this experiment:—Beachville, Port Colborne, and Caledon. The analysis of these showed the following composition:—

Beachville	99.4	per cent. CaO
Port Colborne	86.4	" "
Caledon	91.6	" "

Washes were made from each of these limes, and analysed. Following is a table showing the results:

Formula:—Lime 20 pounds, sulphur 15 pounds.

———	Time Boiled.	Sulphur as Sulphides.	Sulphur as Thio-sulphates and Sulphites.	Sulphur as Sulphates.
	min.			
Beachville	60	12.19	1.76	.09
Port Colborne	60	12.77	1.83	.08
Caledon	60	12.89	1.76	.09

On looking over the above results, it is evident that all these limes produce washes of similar composition. We must assume, then, that these are of equal value and thus that no one lime has a value much greater than another for preparing the wash. These limes are all rich in calcium oxide, richer than we may always find, but since it requires about eight and three-quarter pounds of it to combine with fifteen pounds of sulphur to form the sulphide, it is not likely that many Ontario limes to be found on the market will furnish too little for the purpose, when the above formula is used.

Experiment No. II. The effect of increasing the proportion of sulphur to lime:

Amounts Lime.	Sulphur	Time of Boiling.	Sulphur as Sulphides.	Sulphur as Thio-sulphites.
lbs.	lbs.	min.		
20	15	60	12.89	1.76
20	20	60	15.61 } 16.00	2.54
20	20	60	16.40 }	2.54
20	20	120	16.18	2.68

Beachville lime was used in this experiment.

It appears from the table that it takes longer for the maximum amount of sulphur to go into combination where the higher proportion is used, as can be seen by referring to the table in Experiment No. III. Further than this, at the end of one hour only 92.7 per cent. of the sulphur is in combination as compared with 97.6 per cent. in combination where the lower proportion is used. Even at the end of this, only 94.3 per cent. is in combination. Therefore it seems better to preserve an appreciable excess of lime, in order to reduce the waste of sulphur, and the length of time necessary for boiling. Also an excess of lime is desirable in that the thoroughness of the spraying can be more easily controlled by means of the white washing effect on the trees, and in that it imparts a greater adhering quality to the wash.

EXPERIMENT No. III. Length of time necessary for complete combination.

Formula. Lime 20 pounds, sulphur 15 pounds.

Lime.	Time Boiled.	Sulphur as Sulphide.	Sulphur as Thio-sulphate and Sulphite.	Sulphur as Sulphate.
	min.			
Beachville	20	10.94	1.48	.07
"	40	12.37	1.62	.09
"	60	12.19	1.76	.09
Port Colborne	20	11.04	1.27	.09
"	40	12.77	1.54	.12
"	60	12.77	1.83	.08
Caledon	20	11.29	1.48	.09
"	40	11.97	1.69	.09
"	60	12.89	1.76	.09

With the exception of the Caledon lime, the maximum combination was practically effected at the end of 40 minutes; with it one hour was required, at which time 98.2 per cent. of the sulphur was combined, a maximum figure.

The length of time which gives the greatest amount of combined sulphur is sufficient. Any increase in that time augments the cost of manufacture and decreases the effectiveness of the wash by breaking down the valuable sulphur compounds into less valuable ones, viz., sulphides into thio-sulphates, sulphites, and sulphates. In fact, prolonged boiling will actually reduce the total amount of sulphur in combination, as is shown with the Beachville lime in the above table. This last would happen most readily where direct heat is used for cooking, as in the pot or pan method. (See table in Experiment IV.)

EXPERIMENT No. IV. To compare *steam* and *direct heat* methods of boiling.

Lime used. Beachville.

Formula. Lime 20 pounds, sulphur 15 pounds.

Method of Boiling.	Time Boiled.	Sulphur as Sulphide.	Sulphur as Thio-sulphate and Sulphite.
	min.		
Direct heat	20	10.94	1.48
"	40	12.37	1.62
"	60	12.19	1.76
Steam	20	10.94	1.13
"	40	11.86	1.69
"	60	12.52	1.69

From the above results it is seen that direct heat induces a more rapid combination of the lime and sulphur than does the steam heat, but gives a wash of slightly lower value. The difference shown, however, does not give any decided choice of method; but, considering the greater convenience of boiling by steam, it is perhaps the most desirable way to prepare the wash.

Experiments No. V. To compare *Flour of Sulphur* and *Flowers of Sulphur* for making lime sulphur washes.

Lime used. Beachville.

Formula. Same as in Experiment IV.

Kind of Sulphur.	Time Boiled.	Sulphur as Sulphides.	Sulphur as Thio-sulphate and Sulphite.
	min.		
Flowers of Sulphur	20	9.67	1.06
"	40	11.33	1.83
"	60	11.62	1.83
Flour of Sulphur	20	10.94	1.48
"	40	12.37	1.62
"	60	12.19	1.76

These results show that Flour of Sulphur combines somewhat more rapidly and slightly more completely with the lime than does Flowers of Sulphur; and that there is less tendency shown to form the less valuable thio-sulphate and sulphite.

Experiment No. VI. Depreciation of wash if allowed to cool:

Lime used. Beachville.

Formula. Same as Experiment IV.

Treatment.	Sulphur as Sulphide.	Sulphur as Thio-sulphate and Sulphite.	Sulphur in Combination.
Cooked 60 minutes and analysed at once..	12.19	1.76	13.95
Cooked 60 minutes, cooled 24 hours, brought to boil and analysed at once..	11.91	2.01	13.92

These results show that the wash becomes less valuable when allowed to cool before being applied. The change is due to a breaking down of the sulphides into the thio-sulphates and sulphites.

Experiment No. VII. On the development of a green color in the wash during boiling.

It is thought by some who make and use the lime sulphur wash that the development of a green color is a good indication as to when boiling is complete. We found this color formation to be due largely to the presence of iron in the lime or to that derived from the vessel in which the boiling was carried on. The fact remains, at least, that in the absence of iron or some other similar metal, such as copper, lead, nickle, etc., this color does not develop, even after prolonged periods of boiling. Hence the color change cannot be used as an indicator. The length of time it takes for the color to develop depends upon the amount of iron, etc., which is present. With some limes with which we have worked the color appeared about the time that the maximum amount of sulphur is in combination, viz., one hour, and, therefore, in such cases serves as an indicator; but with other limes it did not develop until long after that period; while with others it developed within 20 minutes, at which time only about three-quarters of the sulphur is in combination. Plainly, then, the color change is an indication of completeness of boiling, only in the case of those limes which contain a certain quantity of iron or other like metal.

Incubation of Eggs.

The work on incubation which we began in 1907 was continued during the summer of 1908; but, in addition to a repetition of the study of methods of incubation, we extended the work to include a determination of the amount of carbon dioxide evolved by an egg during the period of incubation. Some interesting data have been obtained. This work has been done by Mr. Fulmer, who has prepared the following statement of the results. It is our intention to continue and widen the investigation as the subject opens up.

Method of Incubation. Our studies on the methods of incubation included, during the past season, the following treatments:— (*a*) water, (*b*) dry, (*c*) zenoleum disinfection, (*d*) hen's grease, (*e*) alcohol and hen's grease, (*f*) zenoleum and hen's grease. The same make of incubator was used in all cases, so as to eliminate any defect which different constructions might give; and natural incubation was included in order to afford us a basis for comparison.

Thus far our data on methods of incubation do not warrant us in drawing any definite conclusions, but the results of last season's work serve to further estabish our finding of 1907, viz., that there appears to be a marked relationship between the strength or vitality of a chick and the amount of lime which it has in its system at the time of hatching. The following data, which is taken at random from the numerous figures obtained in 1908, will serve to show this, and with one or two exceptions is characteristic of all the data obtained:

Table No. 1. Results from incubators showing Lime (CaO) content of chick and notes taken at time of removing from shell at the beginning of the twenty-first day:

Lime (CaO) *Grams.*	*Notes.*	*Lime* (CaO) *Grams.*	*Notes.*
.21828	Vigorous.	.16188	Rather weak, more so than preceding one.
.24648	"		
.24348	"	.20508	Vigorous.
.22908	"	.20388	"
.24348	"	.19848	"
.22428	"	.15390	Very weak.
.17928	Not vigorous looking, but not abnormally weak.	.18240	Weak in appearance.
		.10090	Exceedingly weak.

Whether lime is a cause or an effect is perhaps impossible to decide definitely. The chick may be strong because it has absorbed much lime; or, on the other hand, there may have been a vital force in the egg germ which was tending to produce a strong chick in any case, which, on account of its vital energy was able to take up all the lime which it required for its normal development.

Carbon Dioxide Evolved by an Egg During the Period of Incubation, and the Relationship Between the Amount of the Evolved Gas and the Amount of Lime Absorbed by the Chick. It is a well known chemical fact that carbon dioxide, in the presence of moisture, is able to render soluble and take into solution insoluble calcium carbonate. Since egg-shell is composed largely of calcium carbonate and since the developing chick requires a supply of calcium, or lime, for building its bone and other body structures, it is reasonable to expect that the shell is the source of

supply and that the developing and respiring embryo attacks and renders soluble (digests) the lime of the shell by means of the carbon dioxide which it excretes. If this be so, then there would likely exist some fairly constant ratio between lime absorbed and carbon dioxide evolved. For the purpose of demonstrating this, and, as well, to satisfy our curiosity as to whether or not CO_2 was evolved, and, if so, to what extent, during incubation, we have started and are still continuing experiments along this line.

We were not long in finding that carbon dioxide is evolved during incubation and in quite large quantity. The following table will show the results with one egg arranged in such a way as to show the run of carbon dioxide from time to time during the twenty-one days.

TABLE No. II. Showing run of carbon dioxide from incubating egg, from day to day:

Number of days.	Amount carbon dioxide evolved (grams.)	Average amount carbon dioxide evolved per day (grams.)
1st to 5th day inclusive	.2288	.04576
6th to 11th "	.4664	.07773
12th to 13th "	.5104	.2552
14th to 15th "	.7568	.3784
16th to 18th "	1.6632	.5544
19th day	.8008	.8008
20th "	.6424	.6424
21st "	.7832	.7832
Total	5.8520	

In all, this egg evolved a total of 5.8520 grams of carbon dioxide gas, enough to render soluble, if all were utilized, about 13.3 grams of calcium carbonate, or about 75 times as much as is usually taken up by the chick. The run of carbon dioxide from day to day gradually increased, as would naturally be expected, until the maximum is reached on the nineteenth day.

Now, is there any relation between the amount of this evolved gas and the amount of lime absorbed? When we began the incubation work in 1907, we started by having on hand the knowledge of the fact that the eggs under a setting hen are surrounded by large quantities of carbon dioxide gas and that the hen usually hatched chicks of greater vitality and higher lime content than we would obtain by artificial incubation. Of course a great deal of the carbon dioxide under a hen comes from her own body, and consequently, it was thought that by increasing the amount of carbon dioxide in the egg chamber of the incubators, which was naturally only about one-third or one-fourth as much in amount as under the hen, artificial hatches simulating natural ones might be obtained. On this assumption, and with this hope, carbon dioxode was introduced into the egg chamber of incubators by various means (See Bulletin 163, p. 55). The results were disappointing, for from the data which was obtained we could only conclude that there was no relation between the carbon dioxide surrounding the eggs during incubation and the amount of lime absorbed, although greater vitality appeared to be imparted, in some cases. The only point left, then, was to

get the amount of carbon dioxide evolved by the egg itself and to determine the lime in the chick hatched and find if any relationship existed there. So far, we have obtained the following figures:

TABLE NO. III.

Egg.	Carbon dioxide (grams).	Lime (CaO) (grams).	Lime per gram carbon dioxide (grams.)	Remarks.
I	.5852	.01625	.02777	All died in shell before end of incubating period.
II	1.8216	.05925	.03252	
III	3.0668	.08775	.02861	
IV	5.8520	.15889	.02097	Healthy chick hatched.
V	6.6809	.17439	.02609	" " "
VI	8.2984	.19200	.01878	" " "
VII	12.9800	.20378	.01293	" " "

It will be seen by examining the above table that a decided relationship between evolved carbon dioxide and absorbed lime exists. The ratio is not constant (column 4), but the greater the quantity of gas evolved, the higher is the amount of lime absorbed. It would seem from this, then, that it is the chick with the greater natural vitality, the one with the freer and more healthy respiration while incubating which will absorb the most lime, and will, consequently, come out of the shell with the stronger and better built body, more likely to withstand the hardships connected with the early life.

WHEAT AND FLOUR TESTING.

In last year's report I gave a description of the appliances we have for grinding wheat and testing the baking qualities of flour. At that time I stated we were prepared and willing to make baking tests and to mill and bake the flour of wheat sent to us by millers and bakers. During the year we have tested a large number of samples and apparently the results have been satisfactory. But it would appear as though many of the millers and bakers do not know of this flour testing plant, or are not familiar with the nature of the the work done, for most of the samples tested have been received from a comparatively few places.

Last December and again this month some fifty or sixty members of the Dominion Millers' Association met in the Chemical Laboratory to see our methods of testing flour, and also to see the results of the tests of the different standard grades of Western spring and fall wheats and such other work as we were able to bring before them. They appeared to be pleased with what they saw, and this year made several suggestions regarding lines of work which they wished investigated.

Testing Varieties of Winter Wheat. During the last year we have made three baking tests of the winter wheats grown on the Experimental Plots in 1907. It would have added a great deal of interest and value to the results obtained if we could have determined the yield of flour for the different varieties of wheat, but this is impossible on our mill. The best we can do is to make a straight grade flour from each wheat.

In February, 1908, we milled a portion of each sample of wheat, and, when the flour was about two weeks old, baked it. About six months later it was again baked. The results are given under 1st and 2nd bakings in the

following table. In November last, the remaining portions of the samples were milled, and the flour kept for about three weeks and then baked. This is the third baking reported in the table. We thus have the results of the freshly milled flour from wheat when about six months old and some of the same sample of flour when aged to the extent of six months, and the freshly milled flour from wheat approximately fifteen months old. The wheat and flour were kept in tin cans in a dry, well aerated room. The results of these tests are given in the following table.

The baking tests were made as described in last year's report, viz., 12 ounces of flour were mixed with water, yeast, and salt, and the dough formed allowed to "rise" in a proof oven, the temperature of which was accurately controlled, and when it was ready for the oven was baked at exactly the same temperature and for the same length of time. The weight and volume of the loaf were determined and then the loaf was cut through the centre and compared with the standard, in general appearance, colour and texture. The quality of the loaf was got from the average of these three points. The figures in all the columns but the first three and the last one represent the difference from the standard loaf expressed in percentages. The standard was made from a straight grade of commercial fall wheat flour of the same age as the flour to be tested. The first two tests were made in comparison with the same flour, and, consequently, as the standard had the same chance to "age" as the flour to be tested, the improvement with the age cannot be traced, except as it improved more or less in appearance, colour, and texture than the standard during the time it was kept. The only place we could show the influence to age of wheat and flour was in the size of loaf, and this we have endeavoured to do by calculating the percentage volume of the loaf in each of the three bakings on the basis of cubic content of the standard loaf of the first baking. The flour used as a standard in the third baking was nearly, but not quite, equal to that of the first and second bakings. It will thus be seen that the results given in the following table really represent three separate tests of the relative quality of the bread each wheat is capable of producing. The tests were made so as to bring out whether the flour from one wheat improved with age more than another, and, also, whether, when kept in the unground condition, aging influenced one variety more than another.

Table Showing Baking Tests With Ontario Winter Wheats.

Name of Variety	Bakings.	Absorption.	Gluten.	Yield of Bread.	Size of Loaf.	Appearance.	Color.	Texture.	Quality of Loaf.	Moisture
		%	%	%	%	%	%	%	%	%
Standard	1st	49.0	25.61	100.0	100.0	100.0	100.0	100.0	100.0	.....
	2nd	47.0	.....	100.0	100.0	100.0	100.0	100.0	100.0	.....
	3rd	47.0	26.01	100.0	100.0	100.0	100.0	100.0	100.0	9.78
Abundance	1st	49.0	25.13	99.8	87.9	90.0	96.0	90.0	92.0	10.58
	2nd	47.0	.....	98.8	88.1	90.0	96.0	90.0	92.0	.....
	3rd	47.0	24.00	101.5	95.2	98.0	102.0	100.0	100.0	10.38
Amherst Isle	1st	50.0	23.82	106.5	97.6	101.0	96.0	100.0	99.0	9.56
	2nd	46.0	.....	96.9	104.4	103.0	100.0	103.0	102.0	.....
	3rd	48.0	22.74	101.2	100.0	100.0	100.0	99.5	99.8	9.45

TABLE SHOWING BAKING TESTS WITH ONTARIO WINTER WHEATS.—*Continued.*

Name of Variety.	Bakings.	Absorption.	Gluten.	Yield of Bread.	Size of Loaf.	Appearance.	Color.	Texture.	Quality of Loaf.	Moisture.
		%	%	%	%	%	%	%	%	%
American Banner	1st	50.0	24.41	101.1	90.4	90.0	98.0	90.0	90.3	9.39
	2nd	46.0	.....	97.9	84.4	91.0	99.5	94.0	94 8	.....
	3rd	49.0	23.66	100.6	104.8	102 0	99.0	100.0	100.3	8.90
American Wonder	1st	47.0	25.01	101.9	78.9	85.0	94.0	90.0	89.7	9.20
	2nd	46.0	.....	99.6	79.4	92 0	98.0	98.0	96.0	.....
	3rd	46.0	23.80	98.3	99.4	97.0	99.0	95.0	97.0	9.68
Arctic Junior	1st	47.0	26.33	99.8	95.8	100.0	101.0	100.0	100.3	12.50
	2nd	48.0	.....	100.8	104.4	103.0	102.0	102.0	102.3	.....
	3rd	49.0	23.80	99.6	107.4	102.0	103.0	103.5	102.9	8.78
Auburn	1st	46.0	26.81	100.0	81.7	91.0	95.0	92.0	93.7	10.56
	2nd	47.0	.....	98.8	90.0	96.0	97.0	97.0	96.8	.....
	3rd	50.0	26.00	102.1	110.2	99.5	100.0	95.0	98.2	8.09
Banatka	1st	55.0	30.16	102.4	100.0	103.0	98.0	102.0	101.3	9.50
	2nd	54.0	.....	100.2	114.4	103.0	99.0	100.0	100.7	.....
	3rd	51.0	28.47	100.6	106.6	104.0	99.0	100.0	101.0	9.57
Bald Pootung	1st	49.0	27.36	102.4	81.3	85.0	97.0	90.0	90.7	11.69
	2nd	48.0	.....	98.5	85.6	96.0	98.0	99.0	97.7	.....
	3rd	49.0	25.11	101.2	102.4	100.0	100.0	98.0	99.3	10.92
Bearded Pootung	1st	47.0	26.63	101.3	84.4	100.0	102.0	101.0	101.0	9.31
	2nd	48.0	.....	99.6	104.4	100.0	99.0	101.0	100.0	.....
	3rd	50.0	27.57	100.6	106.0	102.0	102.5	104.0	103.8	8.85
Beardless Rural New Yorker	1st	47.0	23.70	101.1	80.1	90.0	96.0	91.0	92.3	9.32
	2nd	46.0	.....	95.0	80.6	93.0	98.0	94.0	95.0	.....
	3rd	48.0	24.42	100.0	97.0	100.0	100.5	100.0	100.2	9.55
Buda Pesth	1st	50.0	21.61	105.5	94.4	104.0	98.0	103.0	102.3	10.06
	2nd	49.0	.....	99.0	109.4	103.0	98.0	102.0	101.3	.....
	3rd	53.0	28.33	100.6	116.2	107.0	101.5	106 0	104.6	9.35
Bulgarian	2nd	46.0	27.68	99.8	100.0	104.0	101.0	104.0	103.0	.....
	3rd	48.0	27.75	102.1	99.4	100.0	101.0	101.5	100.8	9.16
Clawson Longberry	1st	51.0	27.17	105.7	88.6	95.0	97.0	97.0	96.7	9.76
	3rd	49.0	26.40	100.6	91.0	96.0	98.0	96.0	96.7	9.25
Crimean Red	1st	58.0	29.32	104.9	102.4	104.0	95.0	104.0	101.0	11.23
	2nd	50.0	.....	101.0	101.9	103.0	98.0	104.0	101.6	.....
	3rd	52.0	29.14	100.8	124.1	107.0	101.0	104 0	104.0	9.45
Dawson's Golden Chaff	1st	51.0	25.01	104.7	81.9	90.0	95.0	97.0	94.0	8.56
	2nd	46.0	.....	99.8	81 9	91.0	95.0	97.0	94.3	.....
	3rd	49.0	25.14	101.2	100.6	98.0	99.0	98.0	98.3	9.55
Economy	1st	46.0	25.13	99.6	92.1	92.1	100.0	99.0	97.0	9.87
	2nd	47.0	.....	99.4	100.6	97.0	96.0	95.0	96.0	.....
	3rd	48.0	25.66	99.4	106.6	102.0	99.0	97.0	99.3	10.22
Early Genesee Giant	1st	49.0	26.33	99.4	95.2	95.0	97.0	94.0	95.7	10.59
	2nd	48.0	.....	99.4	99.4	98.0	99.0	99.0	98.7	.....
	3rd	48.0	24.75	99.8	100.0	101.5	101.5	100.0	101.0	10.42
Early Ontario	1st	52.0	26.00	103.2	98.9	100.0	96.0	100 0	98.7	9.05
	3rd	50.0	25.43	101.2	100.2	103.0	98.0	99.0	100.0	8.18

TABLE SHOWING BAKING TESTS WITH ONTARIO WINTER WHEATS.—*Continued.*

Name of Variety.	Bakings.	Absorption.	Gluten.	Yield of Bread.	Size of Loaf.	Appearance.	Color.	Texture.	Quality of Loaf.	Moisture.
		%	%	%	%	%	%	%	%	%
Early Red Clawson	1st	50.0	24.29	102.7	78.3	90.0	96.0	96.0	94.0	10.40
	2nd	46.0	.....	98.5	80.6	90.0	98.0	99.0	95.7	.....
	3rd	49.0	24.97	101.6	97.0	98.0	100.0	97.0	98.3	10.02
Early Red Chief	1st	50.0	27.05	100.6	86.7	89.0	97.0	90.0	92.0	.....
	2nd	46.0	.....	99.8	96.4	100.0	97.0	99.0	98.7	.....
	3rd	49.0	26.88	100.6	98.8	100.0	100.0	100.0	100.0	8.35
Egyptian Amber	1st	51.0	25.85	103.0	100.0	101.0	96.0	101.0	99.3	10.61
	2nd	48.0	.....	99.2	104.4	98.0	99.0	100.0	99.0	.....
	3rd	49.0	24.06	100.1	111.4	104.0	101.0	102.0	102.3	9.03
Extra Early Windsor	1st	46.0	24.05	100.4	77.7	90.0	96.0	91.0	92.3	9.36
	2nd	46.0	.....	97.5	88.1	80.0	100.0	85.0	88.3	.....
	3rd	48.0	.....	98.5	95.6	98.5	100.0	96.0	98.2	9.19
Forty-Fold	1st	46.0	26.33	101.1	79.5	96.0	101.0	97.0	97.0	.....
	2nd	46.0	.....	99.4	88.1	100.0	101.0	102.0	101.0	.....
	3rd	49.0	24.06	100.6	93.4	95.0	99.0	95.0	96.3	8.36
Geneva	1st	47.0	24.77	100.0	95.2	100.0	100.0	100.0	100.0	11.18
	2nd	46.0	.....	99.2	88.8	100.0	100.0	100.0	100.0	.....
	3rd	48.0	24.74	98.5	108.4	99.0	98.0	96.0	97.7	10.12
Genesee Reliable	1st	49.0	25.25	101.9	88.6	95.0	97.0	94.0	95.3	10.59
	2nd	46.0	.....	98.5	99.4	102.0	99.0	101.0	100.7	.....
	3rd	48.0	23.00	98.8	106.6	104.0	99.0	100.0	101.0	9.58
Ghirka	1st	48.0	27.53	99.2	93.4	94.0	97.0	95.0	95.3	10.24
	2nd	49.0	.....	99.6	106.9	99.0	98.0	100.0	99.0	.....
	3rd	50.0	26.74	101.5	112.0	102.0	100.5	105.0	102.5	9.32
Harvest King	1st	48.0	.....	100.6	100.0	100.0	100.0	100.0	100.0	.....
	3rd	49.0	23.00	100.0	109.0	102.0	98.5	95.0	98.5	9.58
Imperial Amber	1st	48.0	24.89	101.5	92.7	100.0	100.0	100.0	100.0	9.54
	2nd	47.0	.....	98.5	100.0	104.0	99.0	103.0	102.0	.....
	3rd	49.0	26.97	100.4	104.2	103.0	98.0	100.0	100.3	9.45
Iron Clad	1st	50.0	30.16	102.9	92.7	99 0	100.0	100.0	99.7	11.46
	2nd	48.0	.....	99.4	91.9	99.5	100.0	100.0	99.8	.....
	3rd	50.0	30.38	100.4	104.8	98.0	98.0	100.0	98.7	7.99
Kentucky Giant	1st	50.0	.....	100.8	93.4	95.0	96.0	95.0	95.3	.....
	2nd	46.0	.....	100.2	104.4	102.0	95.0	98.0	98.3	.....
	3rd	50.0	26.09	100.4	107.2	101.0	101.0	102.0	101.3	10.16
Manitoba Red Fife	1st	49.0	28.61	101.7	83.8	90.0	95.0	92.0	92.7	.....
	2nd	46.0	.....	98.5	88.8	99.5	97.0	99.0	98.5	.....
	3rd	49.0	26.73	100.2	120.4	103.0	100.5	101.0	101.5	9.33
New Mammoth Amber	1st	48.0	26.71	99.6	84.9	96.0	99.0	98.0	97.3	11.10
	2nd	46.0	.....	98.3	86.9	92.0	99.5	94 0	95.2	.....
	3rd	48.0	24.39	100.0	101.2	101.0	101.0	100.0	100.7	9.57
Michigan Amber	1st	47.0	23.10	98.7	93.4	98.0	99.0	98.0	98.3	10.48
	2nd	46.0	.....	97.9	98.8	100.0	98.0	100.0	99.3	.....
	3rd	49.0	24.78	101.9	107.2	102.0	102.0	104.0	102.7	8.46

TABLE SHOWING BAKING TESTS WITH ONTARIO WINTER WHEATS.—*Continued.*

Name of Variety.	Bakings.	Absorption.	Gluten.	Yield of Bread.	Size of Loaf.	Appearance.	Color.	Texture.	Quality of Loaf.	Moisture.
		%	%	%	%	%	%	%	%	%
Mogul	1st	47.0	26.57	100.0	84.4	94.0	98.0	96.0	96.0	.....
	2nd	46.0	.....	98.3	93.1	97.0	98.0	98.0	97.7	.....
	3rd	48.0	25.72	98.8	94.5	99.0	101.5	98.0	99.5	10.16
Monarch	1st	46.0	24.89	98.9	85.6	98 0	100.0	99.0	99.0	10.19
	2nd	46.0	.....	100.8	101.3	97.0	100.0	97.0	98.0	.....
	3rd	51.0	25.65	101.6	103.6	102.0	99.0	102.5	101.2	9.27
McGarvin	1st	50.0	25.85	105.7	98.6	101.0	94.0	102.0	99.0	8.16
	2nd	49.0	.....	100.4	99.4	100.0	98.0	102.0	100.0	.....
	3rd	47.0	25.29	98.3	95.9	100.0	100.5	99.0	99.8	10.82
McPherson	1st	47.0	27.29	100.0	88.6	96.0	97.0	94.0	93.7	9.81
	2nd	47.0	.....	97.7	89.4	96.0	97.0	97.0	96 7	.....
	3rd	50.0	25.74	102.1	112.0	104.0	102.0	101.0	102.3	8.62
Never Kill	1st	46.0	27.05	98.3	86.2	99.0	100.0	100.0	99.7	9.27
	3rd	48.0	25.92	98.5	94.5	99.5	98.0	96.0	97.8	9.95
New Invincible	1st	50.0	25.85	103.4	86.7	90.0	94.0	97.0	93.7	10.81
	2nd	47.0	.....	100.0	88.1	96.0	97.0	98.0	97.0	.....
	3rd	49.0	25.15	99.6	100.6	100.0	101.0	101.0	100.7	9.38
New Paris Prize	1st	47.0	25.31	100.4	79 8	89.0	97.0	90.0	92.3	9.47
	2nd	46.0	.....	98.3	90.6	100.0	100.0	102.0	100.7	.....
	3rd	48.0	23.34	99.6	98.8	98.0	100.0	98.0	98.7	9.62
Nigger Wheat	1st	47.0	29.56	100.4	91.6	98.0	98.0	96.0	97.3	11.08
	2nd	48.0	.....	99.4	103.8	99.0	100.0	100.0	99.7	.....
	3rd	49.0	27.66	100.0	99.3	100.0	102.0	105.0	102.3	10.42
No. 5 Red Wheat	1st	56.0	24.69	106.8	89.1	100.0	94.0	100.0	98.0	9.46
	3rd	49.0	24.55	101.9	88.0	98.0	99.5	97.0	98.2	10.49
No. 8 Red Wheat	1st	55.0	24.83	104.9	97.1	100.0	94.0	98.0	97.3	8.75
	2nd	47.0	.....	98.1	95.0	98.0	97.0	99.0	98.0	.....
	3rd	50.0	23.07	101.7	99.4	97.0	99.5	96.0	96.8	9.75
Northwester	1st	49.0	24.89	101.5	89.1	98.0	100.0	98.0	98.7	10.72
	2nd	48.0	.....	99.4	100.0	100.0	101.0	101.0	100.7	.....
	3rd	48.0	25.01	99.8	100.0	96.0	100.0	97.0	97.3	9.96
Onigara	1st	47.0	24.29	100.4	83.8	95.0	98.0	97.0	96.2	9.50
	2nd	48.0	.....	100.4	91.3	96.0	96.0	96.0	96.0	.....
	3rd	49.0	26.06	100.4	106.0	102.0	102.0	102.0	102.0	9.63
Padin	1st	49.0	25.73	104.8	95.3	100.0	95.0	98.0	97.7	10.48
	2nd	45.0	.....	100.6	100.6	102.0	98.0	100.0	100.0	.....
	3rd	48.0	24.42	99.8	104.9	100.0	98.5	99.5	99.3	9.87
Paramount	1st	50.0	25.51	101.3	90.0	96.0	98.0	95.0	96.3	10.24
	3rd	48.0	25.08	99.6	105.4	103.0	103.0	104.0	103.3	10.32
Prize Taker	1st	48.0	24.65	100 8	75.9	90.0	98.0	92.0	93.3	9.14
	2nd	46.0	.....	95.0	80.6	92.0	100.0	96.0	96.0	.....
	3rd	48.0	21.71	98.8	93.3	96.5	98.0	96.0	96.8	8.82
Prosperity	1st	46.0	21.78	100.2	80.1	90.0	94.0	91.0	91.3	10.60
	2nd	48.0	.....	99.6	96.3	94.0	98.0	95.0	95.7	.....
	3rd	49.0	24.81	98.5	97.6	97.0	98.0	98.0	97.3	8.66

TABLE SHOWING BAKING TESTS WITH ONTARIO WINTER WHEATS.—*Continued.*

Name of Variety.	Bakings.	Absorption.	Gluten.	Yield of Bread.	Size of Loaf.	Appearance.	Color.	Texture.	Quality of Loaf.	Moisture.
		%	%	%	%	%	%	%	%	%
Red Hussar	1st	47.0	24.89	99.2	75.3	90.0	94.0	91.0	91.7	10.66
	2nd	46.0	.....	97.5	80.6	93.0	98.0	94.0	95.0	.....
	3rd	48.0	22.62	97.7	91.5	97.0	101.0	94.0	97.3	8.13
Red Wave	1st	46.0	23.39	99.6	75.3	96.0	101.0	97.0	98.0	9.33
	3rd	49.0	21.48	101.7	91.0	95.0	101.0	96.0	97.3	8.69
Royalty	1st	47.0	26.05	99.6	85.6	96.0	99.0	98.0	97.7	9.83
	2nd	46.0	.....	99.8	86.3	90.0	100.0	94.0	92.7	.....
	3rd	47.0	23.88	99.6	104.9	98.0	100.0	98.0	98.7	10.46
Rudy	1st	49.0	25.49	100.6	96.4	100.0	99.0	99.0	99.3	10 34
	2nd	46.0	.....	96.9	105.0	104.0	98.5	98.0	100.2	.....
	3rd	48.0	24.33	98.5	115.6	103.0	100.0	102.0	102.0	10.32
Russian Amber	1st	47.0	24.77	100.6	90.4	100.0	102.0	102.0	101.3	10.77
	2nd	47.0	.....	99.2	93.8	100.0	100.0	100.0	100.0	.....
	3rd	48.0	23.19	100.6	98.8	101.0	101.5	100.0	100.8	10.51
Scott	1st	55.0	27.28	104.9	97.8	100.0	94.0	98.0	98.8	8.80
	2nd	48.0	.....	100.1	95.0	100.0	101.0	100.0	100.3	.....
	3rd	49.0	26.97	102.1	109.7	102.0	101.0	104.0	102.3	9.36
Silver Dollar	1st	47.0	25 01	99.8	86.7	100.0	100.0	100.0	100.0	9.79
	2nd	46.0	.....	98.8	95.0	98.0	99.0	100.0	98.0	.....
	3rd	48.0	23.55	98.3	98.8	101.0	102.0	102.0	101.7	10.36
Silver Sheaf Longberry	1st	51.0	25.26	104.7	81.9	90.0	95.0	95.0	93.3	7.46
	2nd	48.0	.....	100.4	88.1	94.0	97.0	100.0	97.0	.....
	3rd	49.0	25.26	99.6	93.0	98.0	96.0	97.0	97.0	9.32
Superlative	1st	46.0	25.13	98.3	84.9	92.0	99.0	96.0	95.7	11.22
	2nd	46.0	.....	100.4	90.6	94.0	96.0	95.0	95.0	.....
	3rd	.....	22.69	.....	.....	.....	.....	.....	.....	9.61
Tasmania Red	1st	49.0	29.56	104.2	79.5	95.0	97.0	96.0	96.0	10.38
	2nd	49.0	.....	98.8	91.3	94.0	94.0	99.0	95.7	.....
	3rd	52.0	28.44	102.9	112.0	103.0	100.0	96.0	99.7	8.18
Treadwell	1st	46.0	25.73	99.8	87.9	100.0	100.0	100.0	100.0	11.12
	2nd	48.0	.....	98.8	96.3	100.0	100.0	102.0	100.7	.....
	3rd	49.0	25.06	98.5	113.2	101.0	100.0	100.0	100.3	9.27
Turkey Red	1st	49.0	22.06	104.8	98.1	103.0	96.0	103.0	100.7	10.48
	3rd	49.0	23.04	101.9	107.2	100.0	100.0	100.0	100.0	9.96
Tuscan Isle	1st	50.0	30.60	102.9	87.3	97.0	97.0	98.0	97.3	10.39
	2nd	51.0	.....	100.4	93.8	101.0	98.0	102.0	100.3	.....
	3rd	50.0	27.75	100.4	120.4	106.0	96.0	101.0	101.0	9.67
Yarsolaf	1st	49.0	27 29	101.1	98.7	100.0	94.0	95.0	96.3	11.55
	2nd	49.0	.....	101.7	107.5	100.0	97.5	101.0	99.5	.....
	3rd	50.0	28.49	100.4	109.7	105.0	94.0	102.0	100.3	9.21
Yenide	1st	46.0	26.71	99.8	87.9	96.0	97.0	94.0	95.7	10.61
	2nd	47.0	.....	97.9	103.8	97.0	99.5	99.0	98.5	.....
	3rd	48.0	25.50	100.4	105.4	98.0	100.0	94.0	97.3	9.78

It will be noticed that the per cent. of water absorbed by the flour was in nearly every case lower in the second baking than in the first. No determinations of moisture were made at the time of the second test, but it is probable that after the heat was turned off the building in the spring, the flour absorbed some moisture. As pointed out earlier, the flour used in the third test was made from wheat kept in the laboratory until October. or for about fifteen months. This flour was, in most cases, drier than that made the previous winter, and the absorption was better.

The results of the determination of yield of bread are naturally not so reliable as if a larger quantity of flour were used in the baking; but they are fairly accurate when taken for the purpose of comparison, and much better results can be secured on the other points with the small loaves. Very frequently the smaller loaves weigh the most. As all the loaves were made from the same weight of flour, the differences in weight of bread must be due to difference in the ability of the flour to take up water and hold it in the bread when it is baked. The smaller loaf will naturally present less surface for the evaporation of water, and, as the gluten is either less in quantity or poorer in quality, the bread is less porous, or more sodden. It will be noticed that the yield of bread is greater and the loaf smaller with the first than with the second baking. This would naturally lead one to suppose that the sooner the flour is baked, the better for the baker, but reference to the other columns of the table shows that the loaf improved in size, and that the quality was better when the flour was kept for some time. The full effects of the aging are not brought out in the table, for it will be remembered that the standard used in the first and second bakings was the same and that the standard aged with the samples. Consequently, the better quality of loaf got in the second baking indicates that many of our samples of flour improved more during the six months between the two bakings than the standard, and not that the bread of the second baking was just that much better than at the time of the previous baking. The full improvement in aging can only be seen in the size of loaf; for in this case the volume was figured in percentage of the cubic content of the loaf of the first baking.

The main object was not to study the influence of age on wheat and flour; but to get definite data regarding the yield and the quality of the bread each wheat was capable of producing. The comparative strength of the flours from the wheats is shown in columns giving the "yield of bread" and "size of loaf," and the quality of the flour is brought out in those giving the comparative "appearance," "color," and "texture." The "quality of loaf" is the average of the last named three columns. Taking the third baking as a basis of comparison, the largest loaf was got with Crimean Red, which had a volume of 124.1 as compared with the standard at 100 and an average quality of bread of 104. Buda Pesth had a volume of 116.2 and an average quality of bread of 104.6, while Red Wave had a volume of only 91.0 and an average quality of 97.3. Prize Taker, Never Kill, Silver Sheaf Longberry, Forty Fold, Red Hussar and several others are not much superior to Red Wave. Among the well known varieties, Early Genesee Giant, Egyptian Amber, Michigan Amber, Nigger wheat, Scott, Treadwell, and Turkey Red gave results above the standard, and Dawson's Golden Chaff, Early Red Clawson, Clawson's Longberry, and American Wonder, below the standard.

The ideal wheat is a heavy yielding variety having good milling and baking characteristics. Yield naturally commands the first attention, but we cannot get away from the fact that the wheat is grown to be converted into flour which must have the necessary strength to produce a good loaf of bread.

Therefore, quality of product must be combined with high yielding properties in order that our farmers may command the best price for their products. In order that a comparison may be made of the baking qualities, as given in the above table, with the yield of wheat per acre, we have obtained data on this latter point from the Experimental Department and have incorporated it as a separate table, as follows:

WEIGHT OF GRAIN PER MEASURED BUSHEL AND YIELD OF GRAIN PER ACRE.

Varieties.	Weight per Measured Bushel.	Yield of Grain per Acre.	Varieties.	Weight per Measured Bushel.	Yield of Grain per Acre.
	Lbs.	Bus.		Lbs.	Bus.
Standard	.....	.....	New Mammoth Amber ..	61.94	42.37
Abundance	61.56	63.85	Michigan Amber	62.00	48.20
Amberst Isle	61.69	47.47	Mogul	61.94	60.23
American Banner	61.94	63.75	Monarch	61.38	49.27
American Wonder	61.31	77.12	McGarvin	62.44	52.35
Arctic Junior	62.88	43.88	McPherson	61.63	44.13
Auburn	63.88	40.45	Never Kill	62.38	44.40
Banatka	63.31	49.97	New Invincible	61.50	46.48
Bald Pootung	61.50	42.30	New Par s Prize	59.19	35.50
Bearded Pootung	63.31	37.92	Nigger Wheat	62.31	41.87
Beardless Rural New Yorker	61.88	63.75	No. 5 Red Wheat.. .... No. 8 Red Wheat	60.50 61.56	43.55 49.63
Buda Pesth	62.75	45.92	Northwester	64.00	48.43
Bulgarian	62.81	50.33	Onigara	62.88	37.58
Clawson Longberry	61.56	61.93	Padin	61.50	49.25
Crimean Red	63.31	46.48	Paramount	61.81	52.90
Dawson's Golden Chaff	61.94	60.63	Prize Taker	61.88	62.73
Economy	61.94	45.33	Prosperity	61.50	48.13
Early Genesee Giant	62.06	51.88	Red Hussar	60.38	46.48
Early Ontario	61.88	46.92	Red Wave	59.56	36.73
Early Red Clawson	60.06	48.18	Royalty	61.63	51.33
Early Red Chief	60.56	46.43	Rudy	62.25	41.17
Egyptian Amber	62.50	52.30	Russian Amber	62.56	48.98
Extra Early Windsor	61.81	61.67	Scott	61.56	41.43
Forty-Fold	62.00	62.77	Silver Dollar	60.06	47.47
Geneva	63.13	45.92	Silver Sheaf Longberry	62.44	44.10
Genesee Reliable	62.88	50.75	Superlative	61.19	62.78
Ghirka	62.81	37.72	Tasmania Red	63.56	44.32
Harvest King	62.06	48.80	Treadwell	62.56	56.22
Imperial Amber	63.00	40.70	Turkey Red	62.38	49.85
Iron Clad	63.75	32.17	Tuscan Isle	61.25	35.70
Kentucky Giant	63.19	44.55	Yarsolaf	63.13	46.40
Manitoba Red Fife	61.63	42.62	Yenide	63.13	36.77

There appears to be some relationship between yield per acre, weight per measured bushel and quality of flour as indicated by size and quality of the loaf of bread it will produce.

YIELD AND WEIGHT OF WHEAT, AND QUALITY OF FLOUR COMPARED.

No. of Samples.	Yield per acre, bus. average.	Weight per measured bushel, average.	Size of loaf, average.	Quality of loaf, average.
10 above 60 bushels	63.84	61.78	97.3	98.5
30 between 45 and 60 bushels	49.27	62.05	104.4	100.2
23 below 45 bushels	40.52	62.19	105.3	100.3

The above table shows that, taking the average of the results obtained for the individual wheats and flours, as the yield of wheat per acre decreased, the weight per measured bushel and the size and quality of the loaf the flour was capable of producing, increased.

This statement, however, cannot be applied to individual cases, for there are two or three of the very poorest bread making wheats in the last or lowest yielding group. These are: Red Wave, No. 5 Red Wheat, and Silver Sheaf Longberry. The Crimean Red and Buda Pesth which, as previously stated are the best bread-making wheats in the number tested, stand in the second group; and in the first group of wheat, which gave a yield of over 60 bushels per acre, we find Abundance, American Wonder and Egyptian Amber from which bread was made having qualities considerably above the average. Naturally the best variety of wheat, all points taken into consideration, is the one which will produce the largest number of bushels per acre of wheat and that will yield a large amount of flour capable of being converted into a first class quality of bread.

A study of the data presented indicates that there are some very poor varities on the list and that there are a number of others which will give good results to both the farmer and the miller.

Chemistry in Relation to the Dairy.

During this past season we have not been able to complete any particular line of investigation undertaken in connection with the Dairy Department, but work has been done on three distinct lines. These are:

1. A study of the rate of the change of the insoluble curd of green cheese into soluble compounds as influenced by the temperature of the room in which it is held. Some work was done on this in 1901 and 1902 and reported in Bulletin 131, but there appears to be need for deeper investigation, and a commencement has been made to further study the subject.

2. A study of the loss of milk solids incurred in manufacturing over-ripe milk into cheese. A large number of determinations have been made of the loss of total solids and protein in the whey when normal and over-ripe milk were used in the manufacture of cheese in small vats of the experimental Dairy Department. It is claimed, however, that the conditions were not comparable with those found in large vats in actual factory practice. Hence, we have thought it advisable to study the matter more fully in direct co-operation with the factory cheese-maker before publishing any results.

3. A study of the condition or composition of milk which makes it necessary for the cheese maker of one factory to "set" the milk with a higher degree of acidity than that employed in another and, frequently adjoining, factory. Through the kindness of Mr. Herns, Chief Dairy Inspector, in the western part of the Province, we have secured a few samples of this milk and a careful analysis, especially of the ash, will be made, but it is quite probable that some work in connection with the matter will have to be done in the factories affected next season.

In conclusion, I beg gratefully to acknowledge the hearty co-operation of the various College departments in the carrying out of our year's work.

Respectfully submitted,

R. HARCOURT.

PART VII.

THE PROFESSOR OF SOIL CHEMISTRY AND LECTURER IN GEOLOGY.

To the President of the Ontario Agricultural College:

Sir,—I beg to submit herewith my report for the year 1908.

First and foremost let me thank you and Professor Harcourt for having effected with the Minister of Agriculture a division of the Chemical department, which has given me the position of Professor of Soil Chemistry. This recognition of my services affords me much pleasure, and I trust will be satisfactory to all interested in the chemical work of this College.

Consequent upon this change, I have been enabled to make use of space in the basement of the building for the care and exhibition of specimens of minerals and rocks for the use of students in the study of geology, the teaching of which is part of my duties. I desire here to express my thanks to you for a grant for the purchase of some of our specimens of minerals, and to the Department of Mines at Ottawa for their gratuitous donation of an exceedingly handsome cabinet of Canadian rocks and minerals, numbered and catalogued by Mr. A. A. Johnston, Curator of the Museum for the Dominion Department of Mines, to whom I desire to express my deep sense of obligation for his unwearying courtesy and assistance and for the promise of further help in the future.

The Imperial Oil Company, Ltd., of Sarnia, I must also thank for their donation to our museum, of a large collection of specimens of oils, waxes, and paraffin, products of the oil fields of western Ontario. These specimens will enhance the value of the collection already in the museum.

As a result of the division of the department already mentioned, some changes have been made in my classes. Formerly I taught animal chemistry to the second and fourth years, now I teach the students of these years agricultural chemistry. In connection with this course I have prepared for afternoon work a set of experiments intended to supplement the teaching of the lectures given in the forenoon. As this is the first year I have put this method into practice, though hopeful of good results, I shall not known the value of the plan until the college year is over. I shall, therefore, leave this matter for fuller report next year.

Investigation.

The number of cattle feeds on the market is increasing year by year, owing largely to the increased demand for prepared breakfast foods. The method of manufacturing our cereals into human foods is also changing, so that their by-products have a different composition from what they had only a few years ago. For example, we find bran, linseed meal, and other by-products referred to as "old" and "new process" feeds. The manufacturers also make a practice of putting the sweepings of the mill and similar refuse into the feeds.

These facts, together with others, have led many of the Experiment Stations to publish bulletins giving the chemical and, in some cases, the physical analysis of the cattle feeds sold in the state or province.

In addition to this, a number of the States have passed what are known as "Feeding-Stuff Laws," which require all manufacturers and vendors to

give a guarantee of the percentage of protein and fat in any sample of feed offered for sale. This is certainly a move in the right direction, but it is a well known fact that such guarantee, while furnishing, in a general way, information which would lead to a more intelligent selection of feeds, gives no criterion of the absolute nutritive value of the feeds. It is as important that the feeder of live stock should know what amount of the different nutrients is capable of being assimilated, as it is to know the composition of the feeds in question, for it must be remembered that it is not so much what an animal eats as what it digests that is actually turned into account. Two feeds may have very much the same chemical composition and yet differ materially in nutritive value. Therefore, any information regarding the digestibility of the feeding-stuffs on the market should be of interest to all intelligent feeders. Such information is obtained from actual feeding experiments.

The digestibility of a feeding-stuff is estimated indirectly by determining the undigested matter eliminated from the body in the solid feces and substracting it from the total amount contained in the feed. Hence it is essential that a preliminary feeding be continued for a sufficient length of time to remove the residue of previous feeds from the digestive organs; and, further, that the experiment extend through a number of days in order to eliminate the influence of irregularity of excretion.

Strictly speaking, the results thus obtained do not represent actual or true digestibility for the reason that the feces contain, not only that portion of the feed that is not digested, but also other materials which contain what is commonly designated as metabolic products. These consist largely of residues of secretions poured into the alimentary canal and not resorbed, together with katabolic products produced by the breaking down of the cells of the digestive organs. To obtain the actual digestibility, it would be necessary to separate these from the actually undigested feed and deduct the ingredients of the latter from those of the feeds eaten. No satisfactory method for separating the undigested residue from the metabolic products of the feces has been devised, and it is customary to designate the difference between food consumed and solid excrement as digestible matter, and to assume that the error involved is not serious. Hence the results obtained are slightly below the actually digested amounts.

The principles of all digestion experiments are simple. The feed is carefully sampled and analysed. Weighed quantities are fed to the animals. The solid excrement, which represents the undigested portions of the feed, is collected, weighed, carefully sampled, and analysed.

Prof. Jordan, while at Maine, and Prof. Atwater, at Connecticut were the first to take up this line of work. Later in Pennsylvania, Minnesota, Wyoming, and in our own Province this line of investigation was continued.

An account of the work done in Ontario was given in the College Report for 1906; since the publication of which we have conducted experiments to determine the digestibility of the following feeds:

Oat Dust, obtained from Martin Bros., Mount Forest.

Barley Dust, obtained from Tillson & Co., Tillsonburg.

Corn Meal, obtained from I. E. Simpson, Merlin.

Molac, Schumacher, Banner and Victor feeds, obtained from the Quaker Oats Company, of Peterborough.

Of the latter four feeds we can say very little at present, as the experiments on these feeds are still under way. The digestibility, calorific value, and fuel value of the other three feeds will be, in the pages which are to follow, compared with that of Wheat Bran obtained from the Goldie Flour Mills, Guelph, the digestibility of which we have also determined.

Table of Stock Food Experiment.

Experiment.	Moisture	Protein.	Fat.	Fibre.	Nitrogen free extract.	Ash.	Total.
Oat Dust.							
Analysis ..... p.c.	12.00	14.22	4.61	7.21	58.54	3.42	100.
Steer No. 1.							
Amounts fed ..... lbs.	7.56	8.96	2.90	4.54	36.88	2.15	63.
Amounts uneaten ..... lbs.	.78	.60	.16	.48	4 05	.11	5.18
Amounts eaten ..... lbs.	6.78	8.36	2.74	4.06	32.83	2.04	57.82
Air-dried Excrement .... p.c.	7.35	13.12	3.01	13.21	58.99	4.32	100.
Air-dried Excrement .... lbs.	1.606	2.866	.658	2.886	12.886	.944	21.846
Amounts digested ..... lbs.	.....	5.494	2.082	1.174	19.944	.....	.....
Per cent. digested	.....	65.71	75.98	28.91	60.75	.....	.....
Steer No. 2.							
Amounts fed ..... lbs.	7.92	9.38	3.04	4.75	38.63	2.25	66.
Amounts uneaten ..... lbs.	.46	.44	.16	.32	2.04	.07	3.49
Amounts eaten ..... lbs.	7.46	8.94	2.88	4.43	36.59	2.18	62.51
Air-dried Excrement .... p.c.	7.04	12.82	3.33	12.96	59.43	4.42	100.
Air-dried Excrement .... lbs.	1.701	3.097	.805	3.131	14.359	1.068	24.161
Amounts digested ..... lbs.	.....	5.843	2.075	1.299	22.231	.....	.....
Per cent. digested	.....	65.35	72.05	29.32	60.75	.....	.....
Barley Dust.							
Analysis	9.21	14.08	1.95	10.39	57.42	6.95	100.
Steer No. 1.							
Amounts eaten ..... lbs.	5.204	7.955	1.102	5.870	32.442	3.926	56.5
Air-dried Excrement .... p.c.	12.01	10.72	1.60	14.56	51.49	9.62	100.
Air-dried Excrement .... lbs.	3.192	2.349	.425	3.869	13.684	2.555	26.574
Amounts digested ..... lbs.	.....	5.106	.677	2.001	18.758	.....	.....
Per cent. digested	.....	64.19	61.43	34.09	57.82	.....	.....
Steer No 2..							
Amounts eaten ..... lbs.	5.710	8.730	1.209	6.441	35.600	4.309	62.
Air-dried Excrement .... p.c.	7.90	12.49	1.59	14.19	50.13	13.70	100.
Air-dried Excrement .... lbs.	2.460	3.889	0.496	4.419	15.609	4.266	31.139
Amounts digested ..... lbs.	.....	4.841	.713	2.022	19.991	.....	.....
Per cent. digested	.....	55.45	58.97	31.39	56.15	.....	.....
Corn Meal.							
Analysis ..... p.c.	9.21	11.63	4.83	3.25	69.53	1.55	100.
Steer No. 1.							
Amounts eaten ..... lbs.	5.710	7.211	2.995	2.015	43.109	.961	62.
Air-dried Excrement .... p.c.	8.82	18.42	1.52	3 96	65.27	2.01	100.
Air-dried Excrement .... lbs.	.518	1.081	.089	.232	3.831	.118	5.869
Amounts digested ..... lbs.	.....	6.130	2.906	1.783	39.278	.....	.....
Per cent. digested	.....	85.01	97.03	88 49	91.11	.....	.....
Steer No. 2.							
Amounts eaten ..... lbs.	4.283	5.408	2.246	1.511	32.331	.721	45.5
Air-dried Excrement .... p.c.	10.11	18.96	2.31	4.31	63.12	1.19	100.
Air-dried Excrement .... lbs.	.732	1.373	.167	.312	4.572	.086	7.242
Amounts digested ..... lbs.	.....	4.035	2.079	1.199	27.759	.....	.....
Per cent. digested	.....	74.61	92.57	79.35	85.86	.....	.....
Wheat Bran.							
Analysis ..... p.c.	10.52	15.23	4.37	10.31	54.12	5.45	100.
Steer No. 1.							
Amounts eaten ..... lbs.	6.312	9.138	2.622	6.186	32.472	3.270	60.
Air-dried Excrement .... p.c.	11.45	12.01	5.30	15.86	45.62	9.76	100.
Air-dried Excrement .... lbs.	2.145	2.251	.993	2.972	8.549	1.829	18.740
Amounts digested ..... lbs.	.....	6.887	1.629	3.214	23.923	.....	.....
Per cent. digested	.....	75 37	62.13	51 97	73.67	.....	.....
Steer No. 2.							
Amounts eaten ..... lbs.	6.312	9.138	2.622	6.186	32 472	3.270	60.
Air-dried Excrement .... p.c.	11.55	13.65	4 57	14.22	45 98	10.03	100.
Air-dried Excrement .... lbs.	1.932	2.284	.765	2.379	7.692	1.678	16.730
Amounts digested ..... lbs.	.....	6.854	1.857	3.807	24.780	.....	.....
Per cent. digested	.....	75.00	70.82	61.54	76.25	.....	.....

In carrying out the experiments we used a crate made specially for the purpose. The platform was just large enough to permit the steers to stand up comfortably, and wide enough to enable them to lie down with ease. The floor of the crate was made of slats, placed far enough apart so that the liquid excrement could run through. The manger was arranged at the front for the feed, and a suitable box was placed at the back end of the crate to receive the droppings. The whole crate was raised about two feet above the ground, so that the animals could not step back into the box; and a special fixture was attached behind the steers to prevent their stepping back into the droppings. This fixture also prevented the steers from getting away should they become untied.

The animals used in a number of these experiments were two grade steers, fully developed. They were fed only one kind of feed during each trial, besides, of course, a supply of drinking water. After each experiment they were given a rest of about three weeks, and during that time they were fed ensilage, hay, and roots.

The following are the data observed:

Oat Dust Experiment. Preliminary feeding 9 days, Trial 5 days. Both steers ate this feed readily. Steers lost weight, but appeared to be in perfect health.

Barley Dust Experiment.—Preliminary feeding 10 days. Trial 6 days. Notes: Both steers lost weight during this experiment. Neither appeared to thrive on this feed. Steer No. I. did not eat for two days and Steer No. II. for one day during the preliminary period.

Corn Meal Experiment.—Preliminary feeding 8 days. Trials 5 days. The steers were in good health and quiet; corn meal fed alone.

Wheat Bran Experiment.—Preliminary feeding 6 days. Trials 5 days. The wheat bran was fed alone.

It has been frequently assumed that the same kinds and amounts of nutrients have the same value whatever their source. This would mean, for instance, that a pound of protein or carbohydrates from oat dust or barley dust would have the same nutritive value as a pound of protein from corn meal or wheat bran. A brief review of the preceding table is sufficient to show that such is not the case, as the digestion co-efficients of the constituents of the latter two feeds are much higher than those of the former. Again, we sometimes hear it stated that the larger the amount of woody fibre, the less completely is the feed digested, and the more muscular work is required for chewing the food and for moving it through the alimentary canal. This is doubtless true in some or perhaps in most cases, but, as the results of our experiments show, this statement cannot be taken as an absolute maxim. For, though the percentages of crude fibre in the samples of wheat bran and barley dust used were the same, yet there is a very wide difference between the amount of materials extracted by the animals from these feeds. In the case of wheat bran, the average digestibility of the dry matter is about 62 per cent., while the digestibility of that of the barley dust is only 45.5. Then, too, though we have not determined the energy of muscular work referred to in the above, yet it seems to us reasonable to assume that the greater the amount of a feed which remains undigested the greater will be the expenditure of energy required to eliminate it from the system; and if this is so, then it does not necessarily follow that the amount of woody fibre is the only factor which determines the expenditure of energy. It may be said, therefore, that the completeness of digestion and "ease of digestion" are factors which must be reckoned with, and the actual nutritive values of feed stuffs are quite different from those calculated simply from their composition. From the table of experiments we also learn that the individuality

of the animal has considerable influence on the digestibility of the fed. For instance, Steer No. 1 digested more of all of the constituents in the barley dust and corn meal than did Steer No. II. Hence it is very important in carrying on digestion experiments, in which different feeds are being compared, that a number of animals be used, in order that the effect of the individuality of the animals be eliminated.

The best basis on which we may compare various feeding-stuffs, is their energy producing power, commonly expressed as heat units. Extensive experiments have been conducted to find out the relative energy or heat values of protein, fat, crude fibre, and carbohydrates. These results show that one gram of protein, when oxidized to carbon dioxide and water and urea will liberate 4.1 Calories of heat, one gram of fat will liberate 9.3 Calories, and one gram of crude fibre or carbohydrates will liberate 4.1 Calories when oxidized. Hence by multiplying each of the digested constituents of a feed by its corresponding factor, and adding up the results we obtain the energy values of the feed. For our present purpose it is not necessary to reduce the pounds of each of the digestible constituents to grams as the actual energy value is not essential. So in making up the following table we have considered one pound to be equal to one gram. Then by multiplying the pounds of digested protein by 4.1, the pounds of digested fat by 9.3 and the pounds of digested fibre and carbohydrates by 4.1, we obtain a fair comparison of the feeds, though not the actual energy value of each of them.

Comparative value of 100 pounds of each feed.

Feed.	Steer No. 1.	Steer No. 2.	Average.	Nutritive ratio.		
				No. 1.	No. 2.	Average
Oat dust	224,880	223,319	224,099	1:5.1	1:4.9	1:5 0
Barley dust	193,926	188,017	190,971	1:4.37	1:4.88	1:4.62
Corn meal	354,845	331,613	343,229	1:8.04	1:8.61	1:8.32
Wheat bran	256,850	270,049	263,449	1:4.52	1:4.83	1:4.68

Wheat Bran is to-day selling at Mr. Goldie's Flour Mills at Guelph, at about $20.00 per ton. If we take this feed as the standard and compare the other feeds with it from the energy values obtained above, we have the following values per ton for each of the feeds analysed:—

Wheat Bran, $20.00; Oat Dust, $17.00; Barley Dust, $14.75; Corn Meal, $26.00.

It would not, however, be fair from a practical agricultural standpoint to value a feed only on its power to produce energy. We must also consider its fertilizing value after being fed. The quality of the manure furnished by a mature animal is largely dependent on the quality of the feed fed. A mature animal neither gaining nor losing in flesh will void in the excrement nearly all the nitrogen and ash constituents furnished to it. Hence, by carefully saving all the solid and liquid manure, one is able to return to the land practically all the nitrogen, phosphoric acid and potash in the feed.

With growing animals, fattening animals, or dairy cows this is not possible, as a perceptible quantity of the nitrogen goes to build up animal tissue or furnish milk; and some of the ash constituents are used to build up bone, etc. But in this experiment, and in any case where a maintenance ration is fed to mature animals, practically all the nitrogen, potash, and phos-

phoric acid may be returned to the soil. Hence, in determining the values of these feeds, we have considered that the three elements named were excreted wholly and could have been used as fertilizers.

According to the report of the Department of Inland Revenue of Canada, nitrogen in farmyard manure is worth about 15 cents per pound, phosphoric acid, as P_2O_5, is worth 5 cents, and potash, as K_2O, is worth 5 cents per pound.

The following table gives the fertilizing value of each of the feeds used in the experiment:—

Fertilizing value of one ton of each feed.

Feed.	Nitrogen.		Phosphoric Acid, P_2O_5		Potash, K_2O.		Total value.
	lbs.	Value.	lbs.	Value.	lbs.	Value.	
Wheat bran	48.72	$7 32	57.80	$2 89	32.30	$1 61	$11 82
Oat dust	45.50	6 83	18.48	92	15.52	78	8 53
Barley dust	45.06	6 76	23.52	1 18	30.30	1 52	9 46
Corn meal	37.22	5 58	15.02	75	13 64	68	7 01

By combining the preceding tables, thus including both feeding and manurial values, and taking Wheat Bran as the standard at $20.00 per ton, Oat Dust is then worth $16.00 per ton, Barley Dust $15.20, and Corn Meal $20.75 per ton.

The Corn Meal was made by grinding whole corn and sold f.o.b. at the mill for $19.00 per ton.

Barley Dust contains all the hulls of barley, and our experiment shows it to be very high in crude fibre. For feeding purposes alone it is worth $5.25 per ton less than Wheat Bran and $2.25 per ton less than Oat Dust. Nevertheless it sells readily for $18.00 per ton.

Oat Dust, on the other hand, sells for $8.00 per ton and is worth for feeding purposes alone, when compared with bran, $17.00 per ton.

These facts lead us to conclude: First, that the prices charged for by-products from the mills are no indication of their actual feed value.

Second, that the by-products from different mills must vary greatly in composition, and in many cases the market price is set from the inferior article.

Third, that the value of Oat Dust depends wholly on the amount of hulls it contains; that is, if the hulls are sifted out and sold as a separate by-product, then true Oat Dust is a valuable cattle food.

Soil Investigation.

For some years past Professor Harcourt has directed the co-operative experiments with fertilizers on swamp soils, with the idea of ascertaining by this means their special requirements, and it was agreed last spring that he should continue this work until the end of this season and report upon it. During his absence this summer, I looked after the distribution of the fertilizers and issued instructions as to their application. In the spring I secured the names of a number of intelligent farmers who wished to conduct similar experiments in their own localities and supplied them with the materials and instructions necessary. As this latter part of the work is but in the initial stage I am unable to make any lengthy report on it.

In connection with these experiments I respectfully ask that you assign me two or three acres of land on the College farm, where I shall be able to carry out the work under my own supervision with the object of eliminating, as far as possible, errors that would seem almost unavoidable with the individual experimentalist. In my opinion such work would be of the highest value to the practical agriculturist. Experiments conducted on scattered areas on the farm are not to be relied on for satisfactory data on which to base conclusions. It is necessary to have the conditions as uniform as possible and to carry them out on the same plots for a number of years with different crops. I would, therefore, request your earnest consideration of this matter.

Water Analysis.

During the past season we have had a number of requests from different parts of the country for analytical reports on water for drinking purposes. Most of these we have referred to Dr. John A. Amyot, Bacteriologist and Analyst of the Provincial Board of Health. Most of the samples analysed in our laboratory were found to be quite suitable for domestic purposes.

Respectfully submitted,

W. P. GAMBLE.

PART VIII.

THE PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College.

SIR,—I have the honour to herewith submit my annual report for the year 1907-1908.

CLASS ROOM.

The class room work was much the same as usual.

First Year. To this class during the fall term I gave a course of lectures on Veterinary Anatomy, briefly, though somewhat comprehensively considering the anatomy of the horse and the ox. When possible we verified description by the examination of the skeleton of the horse or the living animal. During the afternoon lectures we discussed the erection of horse stables as regards site, drainage, material, ventilation, kinds and arrangements of stalls, both single and box; floors, mangers, feed boxes, etc.; also the general care of horses as regards feeding, watering, grooming, working, etc., and the care of harness, saddles, vehicles, etc. This was followed by a course of demonstrations in scoring and judging horses of different breeds and classes.

During the winter term I gave a course of lectures on "Veterinary Materia Medica," in which we discussed the properties, actions, uses and doses of the different drugs used for the prevention and cure of the ordinary diseases of farm stock. We also discussed the different methods of administering medicines, with the advantages and disadvantages of each.

Second Year. The class room work for this class during the fall term consisted in a consideration of the causes, symptoms and treatment, both preventive and curative, of the common diseases of farm stock, with frequent reference to the proper way of feeding, watering, working, etc., in order to prevent disease. As far as possible we illustrate the point under discussion by examining a living horse, the skeleton or individual bone.

During the winter term I gave a course of lectures on "Veterinary Obstetrics," treating of the phenomena of conception, gestation and parturition: the various causes of sterility and the means by which some of them can be removed; the diseases of both sexes due to the act of reproduction; the general hygienic treatment of pregnant females; the causes of difficult parturition with the means for their removal; the causes, symptoms and treatment of the diseases of both dam and offspring incident to and following parturition until the latter has reached that age at which he can exist independent of the former. We pay special attention to the diseases of the young.

During the afternoons I gave a course of lectures and demonstrations on the practical methods of handling horses and colts, securing animals for minor operations and the performance of the same, as dissecting out tumors, dressing and stitching wounds, checking hemorrhages, lancing abscesses, castrating, dressing teeth, etc., applying blisters and bandages. I illustrated the methods of applying bandages, stitching wounds, administering medicines in the different ways and forms, passing a probang in the ox, puncturing an ox in case of excessive bloating, etc. I also gave to this class

a course in "horse judging," using for the purpose the horses of the institution, those in my own stable, borrowing some and visiting neighbouring studs.

Third and Fourth Years. With these classes I continued the course in horse judging, using our own horses, those of local studs and visiting studs at considerable distance.

Special Dairy Class. To this class I gave a short course of lectures on the causes, symptoms and treatment of the various diseases to which dairy stock is subject.

Short Course in Stock Judging. This course, which was held in January, was well attended, and as usual, those who attended expressed themselves as being well satisfied. We gave a practical course of scoring and judging horses of the different breeds and classes. In this I was ably assisted by Geo. Grey, Esq., of Newcastle. I take this opportunity of publicly thanking those gentlemen who so kindly supplied horses for scoring and competition in the different classes, viz.; Messrs. Sorby, McCannell, Atchieson, Hurley, McPherson, Dr. Short and others.

Breeding Horses.

Our three Clydesdale mares were all in foal and each produced a living foal. Two of these continued to do well, but the third died of acute diarrhoea when about 36 hours old.

Injuries and Diseases of Stock.

In the different classes of stock we had cases of the ordinary diseases, but no fatalities except in newly born animals.

Respectfully submitted.

J. H. REED.

Guelph, November, 1908.

PART IX.

THE PROFESSOR OF DAIRY HUSBANDRY.

To the President of the Ontario Agricultural College.

SIR,—I beg leave to submit my eighteenth annual report of the Dairy Department of the College.

The teaching work for the year has been along lines similar to those followed in other years, except that for the special dairy class, double the time formerly given, was devoted to laboratory work in Dairy Chemistry and Dairy Bacteriology. This enabled the class to better grasp the principles of chemistry and bacteriology as applied to dairying. In former years students complained that they were given too much in the short time allotted to laboratory instruction.

We are indebted to the Chemical and Bacteriological Departments for assistance rendered with the special dairy classes and also to several of the College Professors and their Assistants for special lectures.

The Chemical and Live Stock Department have co-operated with us in experimental work during the year. We thank them.

I am specially indebted to my assistants Messrs. Stratton, Taylor, Ralph and Wood, and also to Miss Lillian Sparrow, stenographer and accountant, for valuable help given during the year. The Instructors of the Dairy School have done good work in the Short Courses, and I take this opportunity of thanking them for their co-operation in making the Short Course helpful and profitable.

The total attendance at the Short Courses in dairying was 78.

Only one person made application for a Dairy Diploma, during the year. This was Mr. Wm. A. Freeman of Condersport, Pa., U.S.A., who attended the Short Course in 1907.

A change in our method of obtaining raw material (milk and cream) for experimental and teaching purposes was inaugurated on April 1st, 1908. Beginning on that date we charged four cents per pound fat for hauling the cream and making the cream into butter. Where patrons delivered their own cream, a charge of three cents per pound fat was made for manufacturing. In the cheese branch of the dairy we handled the milk and made it into cheese for 1½ cents per pound of cheese. Where patrons delivered their own milk, one cent per pound of cheese was charged for making.

The results were very satisfactory to all concerned in the butter branch. In the cheese, owing to the relative high price of butter, a number who started sending milk for cheese-making either changed to sending cream or dropped out altogether, so we were short of milk for experimental cheese work during most of the season.

From our experience during the past year, I would recommend that we continue the present plan of charging a rate for manufacturing butter, but that we purchase the milk outright for cheese-making.

In order to obtain milk for cheese-making we are obliged to pay a price equal to what farmers can get, if sold to milk dealers in Guelph. As a rule, we cannot make this much out of milk made into cheese. The difference

would be a financial loss amounting to from 10 to 25 cents per 100 lbs., but this would be amply compensated for in the experimental and investigational work conducted and in having a sufficient supply of milk for teaching students practical cheesemaking.

Mr. Stratton has had direct charge of the manufacturing and selling part of the dairy work during the year, acting as Manager for the Patrons and also as representative of the Dairy Department in this part of the dairy work. The following table gives a summary of the year's transactions so far as manufacturing and dealing with patrons is concerned.

Summary of Manufacturing Account, Dec. 1, 1907, to Nov. 30th, 1908.

Month.	Milk and cream received.		Milk mfd. into		Manufactured		Paid patrons.	Received
	Milk.	Cream.	Cheese.	Butter.	Cheese	Butter.		
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	$ c.	$ c.
December, 1907	46,327	7,084	2,923	43,404	303	3,942	1,222 54	1,191 08
January, 1908	87,061	12,901	30,747	54,563	2,938	5,801	2,156 28	1,575 86
February	52,841	8,887	28,791	25,020	2,603	4,012	1,453 57	1,887 07
March	49,054	12,202	20,463	29,372	1,856	4,944	1,593 61	2,182 16
* April	26,400	13,355	22,951	3,449	2,093	4,106	1,419 18	173 70
May	31,339	19,212	26,359	4,980	2,401	6,128	1,782 83	241 77
June	38,420	37,783	33,634	4,786	3,221	12,403	2,760 67	457 42
July	30,467	33,996	23,830	6,637	2,171	10,926	2,480 94	387 11
August	29,136	32,138	18,934	10,202	1,773	10,833	2,592 33	373 11
September	23,156	31,303	17,160	5,996	1,638	10,307	2,465 77	352 50
October	13,413	23,211	13,413	.....	1,348	7,403	1,906 71	259 50
November	6,034	16,436	6,034	.....	620	5,137	1,400 57	176 26
Totals	433,648	248,508	245,239	188,409	22,565	85,942	23,235 00	9,257 54

*Beginning April 1st, a rate was charged patrons for manufacturing instead of purchasing the milk and cream.

Condensed Milk.

Owing to the rapid development of the condensed milk industry, I beg leave to recommend that a small condensed milk plant be installed at the Dairy of the College as soon as possible. This is a phase of dairying that is likely to assume large proportions in the near future. There is likely to be a good demand for the products from the milk condenseries and also for skilled men to operate them. We visited three of these plants during the week of November, 1908, and found in two cases, buildings and plants costing from $100,000 to $150,000 each. The three factories were receiving an average of over 100,000 lbs. milk daily for which they were paying the farmers $1.50 per 100 lbs. As these plants are backed by plenty of capital, are operated by skilful workmen, and because they utilize *all* of the milk solids, instead of practically wasting half the solids in milk as is the case in cheesemaking, we look for a strong development of the milk condensing branch of dairying and a corresponding decrease in the cheese industry.

Official Testing of Cows.

On May 1st, Mr. C. S. Wood, formerly Herdsman in the Dairy stable of the College, was appointed to the position of Official Tester in the Dairy Department of the College, and will now have charge of that branch of the

work. As most of the official testing is done during the winter, the season was practically over before Mr. Wood was appointed. During the summer he acted as assistant in experimental work and in the college creamery. He took full charge of the testing of the nine cows, reported on in another place, for milk, fat and casein and also of the "whey butter" experiments. Mr. Wood also acted as Instructor in churning for the Second Year classes during the fall term.

During January, February and March, practically all his time will be given to official test work. We also engage several others, having at times, five or six testers out at one time in various parts of the Province. All expenses are paid by the owners of the cows. In the case of Mr. Wood, those to whom he is sent will pay his travelling expenses and in addition a sum of two dollars per day for his services, which amount is paid to the College.

The following table shows the names of those for whom testing was done during the year, also the number of cows tested. All of the cows tested were Holsteins.

Name and Address.	No. of cows.
Rivers, Walburn, Foldens,	4
Clare, Herbert, Norwich,	2
Richardson, J. W., Caledonia,	9
Bollert, H., Cassel	1
Teeple, A. H., Currie's Crossing	4
Rife, David, Hespeler,	4
Rice, Geo., Tillsonburg,	4
Bailey, J. W., Nober,	2
Haley, M. H., Springford,	7
Pettit & Son, Burgessville,	2
Rettie, James, Norwich,	5
Clemons, G. W., St. George,	3
Smith, R. T., Millgrove,	2
Buckrell, Jno.,	1
Hicks, R. F., Newtonbrook,	3
Gilroy, G. A., Glen Buel,	6
Flatt, D. C., Millgrove,	1
McKenzie, Geo., Thornhill,	1
Hartley, Thos., Downsview,	5
Lammiman, T. J., Curries,	1
Row, Fred, Curries,	2
Kelly, Byron, Kelvin,	3
Manhard, G. H., Manhard,	3
Lillie, Orlands, Wesport,	1
Manhard & Lillie,	2
Mason, W. E., Tyrrell,	3
Brown, W. W., Lyn,	2
Stewart, Jno. W.	2
—	85
30 day tests :	
Manhard & Lillie,	1
Brown, W. W., Lyn,	2
Gilroy, G. A., Glen Buell	2
—	5
1 day test :	
Manhard & Lillie,	1

Testing Milk and Cream.

Since my last report we have tested 73 samples of milk and 95 samples of cream for fat, making a total of 168 samples which have been sent by mail or been delivered to us to test. A number of samples are broken during transit in the mail, hence great care is needed in packing the samples. The bottle should be placed in a special mailing tube or a stiff card board or wooden box which will prevent breaking of the bottle. In addition to the loss of the sample, there is a decided objection to having samples broken in the mail on the part of the Post Office authorities. Our attention has been called to this by the P.O. people and they have asked us to warn all parties of the danger of spoiling mail matter through having milk spilled on it after the bottle is broken.

Casein in Milk.

Previous to the year 1907 no short method was known for determining the amount of casein in milk. Dr. E. B. Hart of the Wisconsin Experiment Station brought out the Hart Casein Tester that year, and it ought to do for the cheese industry what the Babcock fat test has done for the cream-

ery industry. It is somewhat strange that the successor of Dr. Babcock should, seventeen years after the advent of the fat test evolve a second important test, viz., one for the casein of milk.

Principles of Hart Casein Tester. According to the inventor, as given in the twenty-fourth Annual Report of the Agricultural Experiment Station of Wisconsin, p. 119, the principles involved in the method are:

1. "A tube and scale whereby percentages of casein in the milk are read directly."

2. "Establishment of a proper volume of milk to be used that will conform to the tube and scale adopted, allowing percentage of casein to be read directly."

3. "The precipitation of the casein by dilute acetic acid."

4. "Agitation of the precipitate with chloroform to remove the fat."

5. "The application of a definite centrifugal force in order to mass the casein into a pellet."

6. "Reading the per cent. of casein."

Our Experience with the Hart Casein Test. We purchased early in 1908 from the Creamery Package Co., Chicago, a six bottle casein tester at a cost of $24. The chief difficulties we have had in operating the test were, breaking of bottles and expense for chloroform. As ours is a hand machine we also found that to maintain a speed of 2,000 revolutions per minute was rather tiresome. We wrote the manufacturers of the machines regarding the breaking of bottles, but they were unable to offer any explanation as to why so many bottles should break without any apparent cause. Owing to the fact that the directions say, "the chloroform should be of the best quality," we purchased at first the purest form which cost $2.50 per pound. As we found this rather expensive, we wrote Dr. Hart, who said that a quality of chloroform which would give satisfactory results could be got in the United States at 40 to 50 cents per pound. On making inquiry among local druggists the cheapest article we could get was 75 cents per pound in one pound lots and 70 cents per pound in ten pound lots. The manufacturers are now prepared to furnish a small electric motor to operate the Hart Casein tester as well as the Babcock tester, at a cost of twenty-four dollars.

Making the Test. The bottles are hung in a suitable rack for filling. Two cubic centimeters of chloroform are placed in each bottle, then 20 cc. of .25 per cent. solution of acetic acid at 70 degrees F., are put in on top of the chloroform. Five cc. milk at 65 degrees to 75 degrees F., are next added, the thumb is placed over the mouth of the bottle and the whole is inverted, then shaken for 15 to 20 seconds. This enables the chloroform to dissolve the fat. The bottles are then placed in a 15 inch diameter centrifuge and whirled for 7½ to 8 minutes at a speed of 2,000 revolutions per minute. In order to insure uniform and correct speed, a metronome is furnished with the machine. After whirling, the bottles are removed and placed in a rack supporting them in an upright position where they are allowed to stand for ten minutes. The casein is in the form of a pellet which is easily read on the graduated scale of the bottle to one-tenth of one per cent. After reading, the bottles are emptied and washed when they are ready for use again.

Experiments Relating to Casein and Casein Tester.

Hart Casein Tester Compared with Chemical Analysis. While we had every confidence that the inventor was satisfied that the casein tester was practically accurate, otherwise he would not have given it to the public, we arranged with the Chemical department for a series of comparative tests in the months of May, June and July. Altogether 22 tests were made comparing results got by the Hart tester with chemical analysis. The samples

were taken from the College herd milk, from the vat in the cheese room which represented the mixed milk from about a dozen patrons, and from three individual patrons' milk.

Source of Samples.	No. of Samples.	Average p.c. fat in milk.	Average p.c. casein in milk.	
			Hart Casein Tester.	Chemical analysis.
College herd	7	3.80	2.370	2.370
Vat	7	3.67	2.400	2.410
Patron No. 1	2	4.40	2.550	2.627
" 2	5	3.54	2 316	2.334
" 3	1	3.80	2.400	2.527
Totals and averages	22	3.842	2.4072	2.4536

The average difference on the 22 samples between the results got by the Hart casein tester and by chemical analysis was .0464 per cent. higher by chemical analysis. In only one case was the difference more than .2 per cent. In most cases the difference was less than .1 per cent. This is a remarkable showing and is even closer than comparative results got with the Babcock tester for fat as compared with chemical analysis.

Composite Sampling. In order to make the test of practical use in cheese factory work it ought to test composite samples satisfactorily, or some modification of the ordinary fat methods of composite sampling would have to be resorted to.

In the 24th Annual Report of the Wisconsin Station, p. 130, the inventor says "The preservatives in all cases but that of the potassium bichromate had a pronounced influence on the test after twenty-four hours' standing, and should never be used when this test is to be applied."

On p. 132 of the same report we read: "From the data at hand it is certain that the best results are obtained on either unpreserved milks or on milks preserved over but short periods of time with potassium bichromate in the above dilution." (1 tablet to 300 cc. of milk.)

Table showing Comparative Results from Daily and Composite Fat and Casein Tests.

Source of Samples.	No. of days for Comp. Samples.	Milk.	Aver. Fat.		Fat Cr.			Av. Casein.		Casein Cr.		
			Daily.	Comp.	Daily.	Comp	Difference.	Daily.	Comp.	Daily.	Comp.	Difference.
		lbs.	p c.	p.c.	lbs.	l s.	lbs.	p.c.	p.c.	lbs.	lbs.	lbs.
O.A.C.	3	272	3.81	3.8	10.39	10.33	.09	2.56	3.0	6.97	8.16	1.19
"	4	545	3.48	3.5	19 02	19.07	.05	2.34	2.6	12.79	14.17	1.38
"	5	976	3.92	4.0	38.09	39.04	.95	2.73	3 1	26.55	30.25	3.70
No. 4	2	110	3.20	3.2	3.52	3.52	.00	2 23	2.6	2.46	2 86	0.40
"	3	162	3.59	3.5	5.82	5.67	.15	2.25	2.5	3.65	4.05	0.35
No. 3	3	502	4.24	4.0	21.31	20.08	1.23	2.38	2.8	11.98	14.05	2.07
"	6	882	4.09	4.1	36.11	36.16	0.05	2.34	2.6	20.69	22.93	2.24
"	3	517	3.72	3.8	19.26	19.64	0.38	2.41	2.6	12.51	13 44	0.93
"	6	888	3.92	4.0	34.83	35.52	0.69	2.44	*2.5	21.67	22.20	0.53
"	6	866	4.14	4.1	35.88	35.50	0.38	2.56	*2.6	22.21	22.51	0.30
"	5	660	3.81	3.9	25.15	25.74	0.59	2.41	2.9	15.93	19.14	3.21
Averages	4.2	580	3.81	3.8	22.671	22.751	0.08	2.422	2.709	14.31	15.796	1.486

* Very small amount of bichromate preservative used.

The milk from the College herd and from two individual patrons (Nos. 3 and 4) was used in the experimental work done by us for comparative results got by individual casein tests and composite sample tests, using bichromate of potash for preservative and keeping the samples from 2 to 6 days.

Casein in Individual Cow's Milk Belonging to Three Different Breeds of Dairy Cattle.

Beginning May 1st, 1908, and concluding November 15th, 1908, the milk from nine cows, representing three breeds of dairy cattle, having three cows in each breed, were selected for an experiment to ascertain the variation in the casein in milk of different breeds as well as in the milk of animals belonging to the same breed. Incidentally the relation of casein to fat was determined and also the total pounds of milk, fat, and casein for a period of 199 days. The report is preliminary. The work will be continued until we have the results for at least one year—longer if possible. We aimed to have one cow nearly fresh; one, two or three months; and one six months or more in lactation at the beginning of the experiment. The same cows were used throughout the experiment except in one case. The following table gives the chief data relating to the cows used in the experiment.

Herd No.	Breed.	Age.	Date of Calving.	No. of days milking during experiment.	Total No. days milking for each breed.
76	Holstein	8 yrs.	Feb. 7, 1908.	199	
111	"	3 "	May 15, 1907 / Aug. 22, 1908	177	468
128	"	7 "	Nov. 14, 1907 / " 19, 1908	92	
66	Ayrshire	8 "	March 20, 1908	199	
136	"	5 "	" 7, 1907	150	478
133	"	4 "	Oct. 5, 1907 / " 10, 1908	128	
131	Jersey	7 "	" 9, 1907	199	
*132	"	7 "	July 6, 1907	199	
129	"	12 "	Sept. 12, 1907		532
123	"	4 "	July 3, 1907 / Oct. 20, 1908	134	

* No. 132 aborted on June 17, when No. 129 was substituted.

Plan of Experiment. The milk from each cow was weighed morning and evening and samples were taken once a week from each of the milkings for the day. The samples of morning and night were mixed together and tested for the fat and casein the following morning. The fat was determined with the Babcock tester and the casein by the Hart Casein method. The total pounds of milk, fat, and casein given during one week by each cow and by each breed were calculated by multiplying the pounds of milk, fat and casein given in one day, by seven. The monthly and season totals are the sums of the weekly calculations. To give the weekly and monthly details for each cow in the experiment would occupy too much space in the report, hence we give but the summary of the results for each cow and for each of the breeds during the 199 days of the experiment.

SUMMARY OF RESULTS.

Herd No. of Cow.	Breed.	Lbs. milk.	Aver. p.c. fat.	Lbs. fat.	Aver. p.c. casein.	Lbs. casein.	No. of days milking during experiment.
76	Holstein	8,000	3.34	267.52	2.09	167.49	199
111	"	4,054	3.50	141.89	2.13	86.64	177
128	"	2,252	3.47	78.30	2.41	54.37	92
Totals and Average	"	14,306	3.41	487.71	2.15	308.50	468
66	Ayrshire	6,306	3.91	246.62	2.40	151.40	199
136	"	3,538	3.97	140.39	2.04	72.21	150
133	"	3,221	3.83	123.63	2.75	88.74	128
Totals and Average	"	13,065	3.90	510.64	2.39	312.35	477
131	Jersey	3,265	4.11	144.37	2.54	83.10	199
132 and 129	"	2,747	5.08	139.70	2.59	71.28	199
128	"	1,405	5.03	70.79	2.53	35.65	134
Totals and Average	"	7,417	4.78	354.86	2.56	190.03	532
Totals and Averages for 9 cows.	3 Hols. 3 Ayr. 3 Jerseys	34,788	3.89	1,353.21	2.33	810.88	164

It will be noticed in the preceding table that the Holsteins gave the most milk during the period of the experiment, but the Ayrshires were a close second in quantity of milk and were ahead in total pounds of both fat and casein. The average percentages of fat and casein were highest in the Jersey cow's milk. This ought to be satisfactory to all concerned as each of the breed representatives were ahead in something.

The average pounds of fat in the Holstein milk for each pound of casein was 1.58; in the Ayrshires the relative proportions were 1.63 lbs. fat per pound of casein and for the Jerseys 1.86.

The relation of milk casein to milk fat by breeds was Holsteins .63 lbs. casein per pound of fat in the milk; Ayrshires .61 and Jerseys .53.

We thus see that the pounds of fat per pound of casein and the pounds of casein per pound of fat in the milk are very similar in the case of both Holstein and Ayrshire milk, assuming that the cows in the test are fair representatives of the breeds, but that the milk from the Jerseys has a comparatively high proportion of fat to the casein and of course the reverse of this a rather low proportion of casein to the fat in their milk.

VARIATION IN PERCENTAGES OF FAT AND CASEIN. What range of fat and casein (more particularly casein, as that is the special point under investigation) may we expect in cows' milk? The following table shows the highest and lowest percentages of fat and casein in the milk of the nine cows under investigation grouped according to breeds, together with notes regarding the circumstances under which these extreme tests occurred.

Among the Holsteins the extreme variation in the percentage of fat in one day's milk was from 3.2 to 4.6. The casein varied from 1.8 to 3.6, but the extremely high tests were at a time when the cows were nearly dry and were being milked but once a day.

The Ayrshires varied in fat percentage from 3.3 to 5.4 and casein, 2.1 to 4.2. The high tests for fat and casein in this case also were just before the cows went dry.

Breed.	Herd No.	Per cent.	Comments.
Holstein :			
Highest fat.....	111	4.6	Cow on poor pasture and nearly dry, July 20.
Lowest fat.....	76	3.2	Cow tested 3.2 several times during experiment.
Highest casein..	111	3.6	Cow on pasture and nearly dry 3.2, next highest No. 128 nearly dry.
Lowest casein...	111 & 76	1.8	Both cows several times tested 1.8 and 1.9.
Ayrshire :			
Highest fat.....	136	5.4	Cow on pasture, nearly dry.
Lowest fat....	133	3.3	Test made Oct. 18, cow calved Oct. 10. Pasture and silage.
Highest casein..	136	4.2	Test made same date as high fat test.
Lowest casein...	113, 136 & 66	2.1	No. 136 tested 2.1 three times ; No. 133 once and No. 66 six times.
Jerseys :			
Highest fat.....	123	6.4	Cow in stable receiving silage, mangels, hay, bran and molac meal.
Lowest fat.....	131	4.0	
Highest casein..	132	3.6	June 3, cows on pasture, bran and molac feed. Milk was uniformly high in fat (5.2 to 5.8) and in casein (3.0 to 3.6).
Lowest casein...	123	2.1	Calved Oct. 20. Test Nov. 1. Silage, mangels, hay and meal.

The range in tests for the Jerseys were from 4.0 to 6.4 per cent. fat and 2.1 to 3.6 per cent. casein. The average *percentages* of fat and casein were high in the Jersey milk, as is shown in the previous table, but the *total* pounds of fat and casein were considerably lower for the Jersey group than for either of the other two groups, due to a rather low yield in weight of milk—a little over one-half the weight given by each of the others.

Effect of Lactation on Per Cent. Casein in Milk. During the period of the experiment, one Holstein, two Ayrshires and one Jersey freshened. One Holstein, one Ayrshire and one Jersey milked continuously during the whole period of the test from May 1st to Nov. 15th, or 199 days. We shall thus be able to make comparisons as to the effect of lactation on the milk casein, when cows are "drying off" and with the same cows when "fresh" and also with cows which have been milking throughout the experiment. If we select the first and last weeks of the periods of lactation for the cows freshening during the experiment and the first and last week of the period of the experiment for the continuous milkers, and also take the average of three weeks at the end and beginning of the lactation, and for the period of the test, we shall have a fair knowledge of the effect of lactation on the percentage of casein in the milk of the cows under consideration and under the conditions given in the experiment.

In the case of the cows having a continuous lactation during the experiment the table shows the percentages of fat and casein for the first and last weeks and also, average of first three and last three weeks of the experiment. In the case of cows which were dry during a portion of the experiment, or those having an intermittent period of lactation, the table shows the tests for the first and last weeks of the two periods of lactation and not the weeks at the beginning and close of the experiment.

EFFECT OF LACTATION ON PER CENT. FAT AND CASEIN IN MILK DURING 199 DAYS. MAY 8TH, TO NOV. 15TH, 1908.

Herd No.	Breed.	Lactation.	Average p. c. fat in milk for weeks				Average p. c. casein for weeks			
			1st	Last	1st 3	Last 3	1st	Last	1st 3	Last 3
76	Holstein	Continuous	3.2	3 5	3.2	3.6	2.3	2.2	2.1	2.23
66	Ayrshire	"	3.5	4.2	3.6	4.13	2.6	2.5	2.5	2.50
131	Jersey	"	4.2	4.7	4.13	4.60	2.8	2.6	2.66	2.60
111	Holstein	Intermittent	3.3	4.4	3.40	4.33	2.1	3.6	2.00	3.00
136	Ayrshire	"	3.6	4.8	3.76	5.06	3.0	3.6	2.63	3.80
133	"	"	3.3	4.4	3.50	4.33	2.5	3.6	2.30	3.36
123	Jersey	"	4.4	5.0	4.43	5.40	2.1	2.7	2.16	2.90
Average			3.64	4.42	3.71	4.49	2.48	2.97	2.33	2.91

TABLE SHOWING AVERAGE PERCENTAGE OF CASEIN IN MILK BY MONTHS.

Month.	No. of tests.	Average p.c. casein.	Month.	No. of tests.	Average p.c. casein.
May	27	2.72	September	18	2.16
June	35	2.73	October	13	2.25
July	31	2.60	November	23	2.33
August	22	2.30			

The foregoing tests indicate that the milk of these nine cows in the months of May and June averaged highest in percentage of casein; the milk in the month of July was slightly lower, followed by quite a decided drop in August and September, with a gradual increase for October and November. We should not care to place too much emphasis on this part of the work as it is possible that other factors than the month, or season may have been more potent causes of a variation. The work would need to be extended to a large number of cows under various conditions and covering a series of years before definite conclusions could be drawn.

The foregoing table also gives a basis of comparison as to the relative percentages of casein in milk when cows are in the stable spring and fall, with milk from the same cows when on pasture and receiving in addition some bran and molac feed. (One Cow, No. 76, was kept in the stable beginning July 5th., and fed green clover, hay, bran and molac during July and August; mangels, silage, bran and molac during September and October.)

In the month of May, cows were in the stable when the milk averaged 2.72 per cent. casein. During November the cows were again in the stable and the average percentage of casein was 2.33. The average percentage of casein in the milk, when the cows were out of doors most of the time and receiving some meal in the form of bran and molac in addition to pasture or green feed, was 2.41.

By using the same methods we have a comparison between the effects of a ration composed of corn silage, poor hay, bran and molac in the spring, when the casein tests averaged 2.72, with a ration composed of silage,

mixed hay, bran and mixed meal fed during November when the cows were in the stable and when the average percentage of casein in the milk of the nine cows was 2.33. During the summer (June to October inclusive) when the cows were on pasture—sometimes poor on account of the drought—with some meal in addition, the casein in the milk averaged 2.41 per cent.

We would emphasize, however, that it will not be wise to lay too much stress on these points owing to the limited number of cows, and of the few tests made.

Relation of Casein to Fat in Herd Milk. During the months of April to October inclusive we aimed to take a sample, once a week, from each patron's milk delivered at the cheese room. Some of the patrons dropped out for a time, or altogether, so that only three patron's milk were tested weekly throughout the season. The variation in the average individual tests by months of the fat and casein in each of three patron's milk is given for seven months; two patrons for six months; and one for five months, in the following table:

Month, 1908	Patron No. 3		Patron No. 4		Patron No. 5		Patron No. 8		Patron No. 10		Patron No. 11		Av.
	Fat	Casein	Fat	Casein	Fat	Casein	Fat	Casein	Fat	Casein	Fat	Casein	Casein
	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
April....	3.40	2.36	.....	.....	3.36	2.23	3.90	2.20	3.40	2.26	.....	.....	2.26
May	3.43	2.28	3.32	2.24	3.53	2.35	4.12	2.46	3.60	2.28	.....	.....	2.32
June	3.80	2.50	3.30	2.27	3.47	2.30	3.95	2.50	3.52	2.42	3.90	2.55	2.42
July	3.70	2.25	3.35	2.05	3.35	2.25	3.60	2.10	3.60	2.20	3.85	2.30	2.19
August ..	4.05	2.32	3.77	2.35	3.70	2.40	3.25	2.22	3.72	2.37	3.85	2.55	2.37
Septem'r.	3.95	2.45	4.05	2.40	3.53	2.53	3.32	2.15	3.67	2.27	4.70	2.67	2.41
October..	3.95	2.55	4.25	2.77	.....	.....	3.72	2.47	3.97	2.55	4.32	2.82	2.63
Av. for season.	3.78	2.39	3.68	2.37	3.50	2.34	3.70	2.33	3.65	2.34	4.15	2.61	

The following table shows the average percentage of fat and casein for twelve patrons during the season. Some of these patrons did not send milk more than two months, while others continued during the whole season from April to October inclusive. Samples were taken from two to six times per month for testing fat and casein.

Patron.	Average p.c. fat for season.	Average p.c. casein for season.
College herd	3.81	2.46
Patron No. 1	4.51	2.61 (April and May only).
" 2	3.54	2.32 (April, May and June).
" 3	3.78	2.39 (7 months).
" 4	3.68	2.37 (6 months).
" 5	3.50	2.34 (6 months).
" 6	3.60	2.26 (April and May).
" 7	4.00	2.28 (" ").
" 8	3.70	2.33 (7 months).
" 9	3.80	2.75 (4 months, April to July).
" 10	3.65	2.34 (7 months).
" 11	4.15	2.61 (5 months, June to October).
" 12	3.60	2.20 (2 months, June and July).
Average of all	3.79	2.40

Cheesemakers find that it usually takes less milk to make a pound of cheese in September and October, and more milk earlier in the season, particularly in the months of July and August. In order to see whether or not there was much difference in the percentages of casein in the average of individual patron's milk and also in the vat of milk as received by us during the season, we have averaged the percentages of fat and casein for each of the patrons by months and also the same for the vats of milk used in our regular experimental work during the season. As previously explained, samples were taken from each patron's milk about once a week, and from the vat as often as possible from April to October. Some eighty-four casein tests of vat milk were made during the season.

Table Showing Average Percentages of Fat and Casein by Months in Patrons' and Vat Milk.

Fat and Casein.	April.	May.	June.	July.	August.	Sept.	October.	Season.
Percentage of fat :	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
Patrons' milk.....	3.76	3.76	3.65	3.61	3.72	3.87	4.04	3.77
Vat milk	3.67	3.64	3.64	3.53	3.75	3.72	3.97	3.67
Percentage of casein :								
Patrons' milk.....	2.35	2.41	2.42	2.27	2.37	2.41	2.63	2.38
Vat milk.....	2.30	2.28	2.46	2.31	2.40	2.45	2.61	2.39

Table showing Yield of Cheese per pound Fat and Casein in Milk by Months, as determined by Experiments in Preceding Table.

——	April.	May.	June.	July.	Aug.	Sept.	Oct.
Lbs. Cheese per lb. fat in milk..	2.48	2.51	2.63	2.61	2.49	2.63	2.55
Average p.c. fat in milk.....	3.67	3.64	3.64	3.53	3.75	3.72	3.97
Lbs. Cheese per lb. casein in milk	3.96	4.10	3.89	3.99	3.89	4.00	3.87
Average p.c. casein in milk....	2.30	2.28	2.46	2.31	2.40	2.45	2.61

Relation of Casein in Milk to Yield and Quality of Cheese.

Two series of experiments were conducted during the season to find the relation of casein in milk to the quantity and quality of cheese produced. In the first series, thirty-four experiments were made for which were used 38,737 lbs. milk testing an average of 3.64 per cent. fat, and 2.37 per cent. casein. The whey from all the lots tested an average of .204 per cent. fat. We aimed at making one experiment each week throughout the season or about four each month. Some months there were less and some more than four trials made.

The results are conveniently grouped by months in the next table.

Table Showing Relation of Casein in Milk to Cheese Yield by Months.

	April.	May.	June.	July.	Aug.	Sept.	Oct.
Lbs. Milk	5,463	12,776	6,788	2,332	3,815	4,060	3,503
Av. p.c. Fat	3.75	3.48	3.64	3.57	3.74	3.72	3.98
Lbs. Fat	204.46	445.13	247.54	83.29	142.84	151.17	137.95
Av. p.c. Casein	2.3	2.24	2.48	2.41	2.39	2.43	2.65
Llbs. Casein	125.64	286.76	168.33	56.35	91 33	98.88	93.12
Av. p.c. Fat in Whey	0.22	0.26	0.19	0.19	0.18	0.20	0.20
Lbs. Cheese	504	1,176	660	218	363	388	356
Lbs. Cheese per lb. Fat in Milk	2.46	2.41	2.66	2.61	2.54	2.56	2.54
Lbs. Cheese per lb. Casein in Milk	4.01	4.10	3.92	3.86	3.97	3.92	3.82
Lbs. Milk per lb. Cheese	10.83	10.86	10.28	10.69	10.51	10.46	9.84
Lbs. Cheese per 1,000 lbs. Milk	92.2	92 04	97.2	93.4	95.1	95.5	101.3

The average percentage of fat in the milk used for all the foregoing experiments was 3.64 and that of the casein, 2.37. The average pounds of cheese per pound of fat in the milk was 2.59 and per pound of casein 3.98. The average weight of milk required for one pound of cheese was 10.56 lbs. The average yield of marketable cheese was 94.6 lbs. per 1,000 lbs. milk.

The curds at dipping averaged 48.76 per cent. moisture; the green cheese contained 34.98 and the cheese when sold, 34.92 per cent. moisture in the samples tested, but not all were tested for moisture.

The cheese scored an average of 93.23 points out of 100 for quality.

Comparative Tests on the Influence of Casein in Milk on the Weight and Quality of Cheese made on same Day.

In the previous experiments, all the milk delivered in one day was put into one vat and made into cheese in the usual way at various times throughout the season of seven months. In the following experiments, of which there were five, the milk was divided between two vats on the same day. In the one vat we aimed to have the milk from patrons delivering milk with a rather low casein content; in the other, milk of a high casein content. The differences were not so wide as we should have liked for these tests, but it seemed difficult to get sufficient milk of each to make a cheese.

After the milk had been divided into two nearly equal portions on the basis of previous tests for casein, the vats were tested for fat and casein and both handled as nearly alike as possible at the various stages of manufacturing into cheese. Altogether there were used 5,140 lbs. milk. The lots in the one vat averaged 3.51 per cent. fat and 2.32 per cent. casein. The other lots averaged 3.75 per cent. fat and 2.46 per cent. casein. The average difference in the percentage of casein in the milk of the two vats was but .14 per cent.—not sufficient, one might think, to make any appreciable difference in yield and quality of the cheese although the average yield of marketable cheese per 1,000 lbs. milk was 88.4 from the low casein milk and 94.5 from the high casein lots—a difference of 6.1 lbs.

There was very little difference in the moisture contained in the two curds, or in the cheese. The lots of cheese made from the milks containing the higher percentage of casein averaged 34.8 per cent. moisture in the marketable cheese, while the other lots averaged 34.4—.4 per cent. less. The weight of milk required to make a pound of cheese averaged 11.3 lbs. for the low casein lots and 10.58 lbs. for the higher casein vats.

There was practically no difference in the quality of cheese from the two vats. The low casein lots of cheese scored an average of 91.9 points out of 100, while the others (higher casein) scored an average of 91.7 points.

Conclusions.

As previously stated the present report should be considered as a preliminary one, on a comparatively new phase of dairy work; therefore we do not feel justified in attempting to draw too many, nor too hard and fast conclusions. Our work so far would seem to warrant the following:

1. The Hart Casein tester appears to be a simple and reliable method for determining the percentage of casein in fairly fresh milk, but is not adapted, in its present form, to testing composite samples, although fairly good results were got by using a small amount of bichromate of potash as a preservative in milk samples for about six days.

2. The claim for "high casein milk" which has been made for certain breeds of dairy cattle is scarcely borne out by the results of the experiments, although a great deal more work will be needed before the matter can be said to be fairly settled.

3. The variation in the percentage of casein in milk does not appear to be so great as is the variation in the percentage of fat in milk. Generally speaking, milk with a high percentage of fat contains also a high percentage of casein, but the increase of the casein is not relatively so great as the fat.

4. As cows advance in lactation they tend to increase in both the percentage of fat and casein in their milk. This is more marked when we compare the milk just before "drying up" with that given soon after freshening.

5. The evidence as to the effect of season on the percentage of casein in milk is somewhat conflicting. For the nine cows under experiment, the highest percentages of casein in the milk was found in the months of May, June and July. In the milk supplied by patrons to the cheese department, the highest percentages of casein were in June, September and October. The lowest average of the nine cows was in September, and the lowest average for the patron's milk was in July. During a couple of weeks in July, the yield of cheese in our cheese room was low and it was found that the milk contained a comparatively low percentage of casein at that time. So far as we know there was no special reason why the milk should have tested low in casein at that particular time.

The average casein tests of the vats of milk in the cheese room were lowest and fairly uniform for the months of April (2.3), May (2.28) and July (2.31). The highest vat tests were for June (2.46), September (2.45) and October (2.61). All the testimony seems to agree that the June milk is comparatively high in casein.

6. The cheese experiments confirm previous conclusions, viz., that the yield of cheese is not in proportion to the fat in the milk. The pounds of cheese per pound of casein in the milk was fairly uniform throughout the season, the extreme variation by months being 3.87 to 4.1. The variation in the percentage of casein in the milk of these experiments was from 2.28 in May to 2.61 in October.

7. The addition of the factor 2, to the percentage of fat in the milk, makes a fairly reliable basis for distributing proceeds of sales at cheeseries. At present, we do not think daily, or weekly testing of milk for casein is practicable in factory work, but a Hart Casein tester along with the Babcock tester ought to be a part of the equipment in every cheese factory, to be used as required.

Whey Butter.

During the past two years considerable interest has been revived in the "whey butter" question. We took this question up several years ago and as a result concluded that it would not pay for manufacturing. Owing to the high price of butter for the past two seasons, and the strong competition from the milk condenseries, cheesemakers have turned to whey butter as an added source of revenue to satisfy patrons and meet the competition which is forcing some cheese factory owners to resort to unusual practices, such as making whey butter, in order to hold their patronage. Many cheese factory owners are growing uneasy. We recently received a letter from the owner of two large factories asking about the future of the cheese trade and whether or not we considered it likely that the milk condenseries would drive the cheese factories out of business. The whole question looks like a serious one for cheese factory owners, of which "whey butter" is only a minor phase. Back of all this there is the growing conviction that present methods of operating cheese factories are not giving financial returns to the farmers which their investment of capital in, and labour spent upon, the work, entitle them to receive. We have not seen the last of the discussion.

The Experiments.

Owing to our limited supply of milk for cheesemaking we were unable to conduct the experiments in as satisfactory a manner as we should have liked. To do this work properly we should have had from 2,000 to 3,000 pounds of milk daily throughout the season, whereas our supply reached this point in the early part of the season only. Later, we were obliged to collect the cream for several days in order to obtain sufficient for a small churning.

The Live Stock department co-operated with us in feeding hogs on whey which contained the fat, and on similar whey from which the fat had been removed by means of a cream separator. This experiment also reduced the amount of whey available for separating and making into butter. (For a summary on this part of the work, see report of Prof. G. E. Day.)

The main points investigated by us in the dairy department were:

1. The yield of butter per 1,000 lbs. whey.

2. The quality of the butter made—when fresh and after keeping for sometime in an ice cold-storage.

3. The effect of pasteurizing the whey cream.

The Yield of Butter per 1,000 lbs. Whey. Three experiments were made on May 4th, 11th and 18th, when the exact weights of milk and whey were obtained. After May 18th the weights of milk and whey were estimated as closely as possible. For the first three experiments, 6,963 lbs. milk and 6,107 lbs. whey were used—an average of 2,321 lbs milk, and 2,035 lbs. whey for each test. The percentages of fat in the milk were 3.8, 3.6 and 3.6, averaging 3.66 for the three experiments. The percentages of fat in the whey before separating were .22, .23 and .3—an average of .26. The whey was separated at a temperature of 120°F. in two cases and at 88° in the other. The pounds of whey cream obtained were 12.25, 20.5 and 31.5 respectively. The respective percentages of fat in the cream were 38, 20 and 19. The percentages of fat in the whey after separating were .005, .01, and .005. After separating the cream was pasteurized in all three experiments at a temperature of 170° F. After cooling, from 2 to 3 lbs. of lactic acid culture was added to each lot and they were allowed to ripen or sour

in the usual way, and churned next day, at a temperature of 55° to 57° F. The acidity of the cream at the time of churning ranged from 3 to 5 per cent. The time required to churn ranged from 12 to 18 minutes. The percentage of fat in the buttermilk ranged from .125 to .3. Salt was added to the butter at the rate of 3/4 to 5/8 of an ounce per pound of butter. The yield of butter was an average of 2.75 lbs. per 1,000 lbs. whey. From the 6,963 lbs. milk used, there was made 16.85 lbs. butter, or an average of 2.41 lbs. per 1,000 lbs. milk.

The percentage of moisture in the butter ranged from 11.35 to 12.30, and averaged 11.746 for the three lots.

Between May 18th and July 6th, six more experiments were made, in which the estimated weight of whey was 8,291 lbs. The milk averaged 3.62 per cent. fat, and the whey before separating .218. The average yield of butter per 1,000 lbs. whey (estimated) was 2.59. The average percentage of moisture in the butter was 11.526.

Taking the average of the two series of experiments we obtained 2.675 lbs. butter per 1,000 lbs. whey. Assuming that the average yield of butter is about 2½ lbs. per 1,000 lbs. whey, a factory having 10,000 lbs. whey daily might expect to make about 25 lbs. butter daily. Assuming further that the factoryman is allowed two cents per pound of butter for making the butter, he would earn 50 cents a day in such a factory, to say nothing about interest on investment in, and wear and tear of machinery. If these experiments are a fair indication of the amount of butter which can be made from whey under factory conditions, we scarcely see how it can be profitable except in the large factories, or where the whey cream from several cheeseries is sent to a central point and there made into butter, such as is being done at Picton, Ont.

The Quality of the Butter. A sample of the butter from each experiment was wrapped in ordinary parchment butter paper and placed in cold storage at a temperature of 40° to 45°F., where it was kept from two to four months. It was scored when fresh and again at intervals of about one month during the season. Six lots were scored by the Creamery Instructors when on a visit to the College on June 13th; one lot was scored by Mr. Stratton and the remainder of the scoring was done by the head of the Dairy Department.

The following table gives the average of the scores of butter made in the two series of experiments and also for two experiments made July 18th and 27th, where the cream was collected for seven and six days respectively before sufficient was obtained for a churning. The cream was kept in cold storage after separating. The lots making up the churnings on July 18th and 27th were pasteurized the day before churning, lactic acid culture was added, and they were allowed to ripen in the usual way.

All the lots were given full score (10) for salt, hence this is not included in the table.

It will be noticed by the scores given to the whey butter that it averaged fairly well—would class as second grade butter when fresh and compared favorably with farm dairy butter as ordinarily offered on local markets.

We were also agreeably surprised at the keeping quality of the whey butter. After holding it under only fair conditions as to temperature, the butter still scored about 40 out of 50 points for flavor, at the end of one to two months.

It will be noticed that the grain and texture of the butter nearly always scored higher at the second and third scorings, than it did at the first. This

is probably due to the fact that the body became firmer after standing in cold-storage for a month or more. The tendency was for a somewhat greasy texture when first made.

TABLE SHOWING QUALITY OF WHEY BUTTER MADE, 1908.

Kind of Butter.	No. of Expts.	Av. Flavor (50)	Av. Grain (20)	Av. Color (15)	Av. Total (100)
(*First Series*)					
Fresh	3	44.	17.6	14.	90.50
1 month old	3	42.25	18.3	13.	89.25
2 " "	3	40 30	18.66	13.6	87.83
3 " "	3	38.30	19.	14.5	87.
(*Second Series*)					
Fresh	6	43.5	18.08	13.25	89.83
1 month old	6	41.75	18.5	13.58	88.83
2 " "	6	37.83	19.	13.50	85 33
(*Third Series*)					
Cream collected for seven days.					
1st score	1	44.	17.	14.	90.
2nd " (1 month old)	1	42.	19.	14.5	90.5
3rd " 2 " "	1	36.	19.	14.	85.5
Cream collected for six days.					
1st score	1	42.	18.	14.5	89.5
2nd " (1 month old)	1	41.	19.	14.	88 5

The lots made on July 18th and 27th scored particularly high in flavor when we consider that the cream was collected in small lots for seven days in one case, and for six days in the other. Not only was the first score for flavor comparatively high (44 and 42 out of a possible 50) but at the end of one month, one lot had decreased but two points and the other, only one point, in flavor. These results indicate fairly good keeping quality—in fact quite equal to ordinary creamery butter.

COMMERCIAL VALUE OF WHEY BUTTER.

We have another means of judging of the quality of the butter made from whey, viz., its commercial value, or value in dollars and cents. In order to ascertain its quality from this viewpoint, we sent lots from ten different churnings to four different grocers in the city of Guelph and asked them to give us an estimate of its market value. In order to be sure that the estimate was a fairly correct one, we requested them to pay us in cash the value of the butter.

Some were rather suspicious, and said that if the butter were in College wrappers they could pay more for it. Others said they would like to know the origin of the butter. In some cases we told them, in others we did not. Our object was to get as closely as we could an idea of the market value of the butter free from sentiment and prejudice, so far as possible. When butter was plentiful in Guelph we had difficulty in selling it at all, but when it was scarce we could have sold large quantities at about two or three

cents a pound under creamery prices. In the latter part of the month of July one man said he would handle all we could furnish at 22 cents per pound. We were receiving at that time 25 cents per pound for our regular make of creamery butter.

In order to be able to compare the relative prices received for whey butter and that obtained for creamery butter, we give the dates of sale and prices obtained during the time of the experiment.

Date.	Price received per pound for	
	O.A.C. Creamery Butter.	Whey Butter.
May 9th, 1908	30 cents.	26 cents.
June 10th, 1908	22 "	20 "
July 12th, 1908	23 "	16 "
July 21st, 1908	24 "	20 "
July 28th, 1908	25 "	22 "
Average five sales	24.8 "	20.8 "

It will be noticed by the foregoing table that the difference in price received for creamery and whey butter varied from 2 to 7 cents per pound and averaged 4 cents for the months of May, June and July. Whether butter was plentiful or scarce had more effect on the relative prices than did the quality of the butter. Butter, simply follows the general law of price in this respect. When an article is scarce, goods of poorer quality always more nearly approach the price paid for articles of good quality. When articles of a special kind are very plentiful, the difference between the prices paid for good and poor are greater, and in some cases it may be difficult to sell goods of poor quality at any price.

Effect of Pasteurizing Whey Cream for Buttermaking.

All the lots of cream except two were pasteurized at temperatures ranging from 170°F., to 180°F. Unfortunately, we did not have sufficient whey cream to divide one lot into two portions, treating one by means of pasteurization and the other by non-pasteurization, consequently we shall have to compare the two lots of unpasteurized butter made June 2nd and 11th with the lots made during the previous and succeeding weeks.

The lot made on June 2nd, scored 46 out of a possible 50 for flavor, when scored on June 9th. The lot made the previous week (May 26th) scored 40 for flavor on May 27th—the day after it was made. The lot made June 11th, scored 41 for flavor on June 13th. The whole milk on this date was judged "Good" whereas the milk on the two previous dates (June 2nd, non-pasteurized, and May 26th pasteurized cream) was marked "Fair." On June 17th the milk was "Fair"; the whey cream was pasteurized at 175°F., and the butter scored 46 on June 20th. Taking the average of the first scores in flavor of two lots pasteurized and two lots unpasteurized we get a score of 44 and 43.5 respectively— a difference of but half a point in favour of pasteurization. There was also very little difference in the other qualities—"grain" and "color".

From the foregoing very limited number of experiments it would seem as if fairly good whey butter may be made without pasteurization.

The relative keeping qualities of the lots pasteurized and unpasteurized are indicated in the following scores of four lots for flavor. The other qualities were so similar that it is unnecessary to give the details.

Kind of Butter.	When Made.	Date of Scoring.	Score for Flavor (50)
Pasteurized	May 26th.	May 27th.	40
Unpasteurized	June 2nd.	June 9th.	46
"	" 11th.	" 13th.	41
Pasteurized	" 17th.	" 20th.	46
"	May 26th.	" 13th.	42
		July 27th.	36
		Sept. 21st.	37
Unpasteurized	June 2nd.	June 13th.	42.5
		July 27th.	39
		Sept. 21st.	35
"	" 11th.	July 27th.	41
		Sept. 21st.	37
Pasteurized	" 17th.	July 27th.	42
		Sept. 21st.	33

One lot of the pasteurized butter lost six points in flavor between June 13th and Sept. 21st, while the other lost eight points between June 20th and Sept. 21st—an average of seven points for the two lots. The non-pasteurized lots made June 2nd and 11th lost 7 and 4 points in flavor, respectively, between the dates of first and last scorings—June 9th and 13th, and Sept. 21st, or an average of 5½ points as compared with 7 points lost by the pasteurized lots. However, one lot of the latter had been held for about four months before scoring for the last time, while the others were given the final scoring at the end of about three months.

Conclusions.

1. The average yield of butter per 1,000 lbs. whey was about 2½ lbs. It seems doubtful if it would pay to manufacture this amount of butter in the average small cheese factory. Only large factories, or where conditions are favorable for centralizing the whey cream, can afford to manufacture whey butter.

2. The quality of the butter was fair and can be sold readily, when there is a scarcity of butter, at from two to three cents per pound under creamery butter prices. When butter is plentiful, it is somewhat difficult to sell, except at considerably reduced prices.

3. The butter appears to possess fairly good keeping qualities so far as these experiments indicate.

4. No special disadvantage seemed to result by non-pasteurization, although we should consider it safer to pasteurize the whey cream wherever practicable.

Methods for Testing Moisture in Dairy Products.

In previous reports we have dealt very fully with methods for determining moisture in dairy work. During the past year we have been able to compare results got by using a "High-Pressure Steam Oven" with results from a "Low-Pressure" steam heated oven, which latter has been described by us in a previous report. Several other methods for determining moisture

have been brought before the public during the past year, among which may be mentioned the "Mitchell-Walker Moisture Test," fully described in Bulletin No. 167 from the Ontario Department of Agriculture. We regret we have not had an opportunity to use this test. We ordered an outfit as soon as we heard of it, but up to the time of writing it has not been delivered.

We do not think we are prejudiced in the matter, but the steam oven appeals to us because of its simplicity and reliability, and because it may be set up in any creamery, cheese factory, or other place where there is steam. There is nothing to break and it requires practically no attention. After samples have been weighed and placed in the oven, the operator may continue about his work until they are ready for the second weighing. This, too, need not be done at any specified time, after allowing sufficient time (about one hour for a high-pressure oven and four to five hours for the low-pressure) for the samples to dry. We have left samples in both high and low pressure ovens for several hours and over night at temperatures ranging from 50°F. to over 300°F., and have not noticed any ill effects on the samples.

The high-pressure oven is made of boiler plate and the parts are riveted or bolted together similar to those in a steam boiler. It will stand any pressure which a steam boiler has to undergo, and for this reason we like it better than the low-pressure oven which being made of galvanized iron tends to leak when the pressure gets too high, though we guard against this by using a safety-valve set to blow off at 8-10 lbs. pressure.

In fifteen comparative tests of butter made with the high and low pressure oven and with samples varying in weight from 2.5 to 20 grams, the average of all the results were 14.69 per cent. moisture by using the high-pressure oven at temperature of 250° to 300°F., and 14.36 per cent. by the low-pressure oven with temperatures of 212 to 219°F. The tendency was for slightly higher results (average .33%) by using the high-pressure oven. Whether this was due to more complete drying or to oxidation of some of the fat, we are unable to say, but are inclined to think it was due to the latter, as the fat always appeared darker in colour from the samples placed in the oven at the higher temperature. However, we do not think that any serious error is likely to be introduced by using the high-pressure oven, and as the results are got more quickly, as compared with the low-pressure oven, we are inclined to favour the former—in fact used it for most of our moisture work during the year.

The high-pressure oven, including combined steam guage and thermometer having a capacity of about 8 samples at once, cost us $18. If there was a demand for the ovens in large numbers we see no reason why they might not be made and sold at a cost of $8 to $10.

In four comparative tests on green cheese the results were 36.65% moisture in samples dried in the high-pressure oven and 36% for similar samples from the low-pressure oven. The tendency of results got with the cheese was similar to that got with butter, viz., slightly higher results by using a higher temperature than 100° to 105°C. for drying samples, which is a standard temperature.

Moisture in Curd and Cheese.

This is the sixth year during which experiments have been conducted relating to the moisture content of curd and cheese and its effect upon weight and quality of cheese made.

The experiments of 1908 were conducted along five different lines. The first of these consisted of sixteen experiments made with 29,135 lbs. milk

altogether, containing an average of 3.64 per cent. fat. The milk was weighed into one vat and treated in the usual way until the whey was removed from the curd, or what is commonly known as "dipping." The average percentage of fat in the whey from all the lots was .24. At dipping, the curd was divided into two nearly equal parts in the "curd sink" or "drainer." The parts of the curd were not weighed, owing to the difficulty of weighing a curd from which the moisture (whey) was running so freely as it does at this time. One-half the curd (A) was not stirred at all, but simply allowed to drain, while the other half (B) was given the usual amount of stirring—was stirred until it was in the judgment of the cheese-maker "dry." Samples were taken for moisture determinations of the curd at dipping, and also from the green and ripened cheese.

The main points in the experiments are indicated in the following table:—

Curd.	Per cent. Acid at			Weight of Cheese		Per cent. shrinkage.	Score. Max. 100.
	Dipping.	Milling.	Salting.	Green Lbs.	Ripe Lbs.		
A. (Not stirred).....	.192	.714	.974	1,318.09	1,267	3.86	92.96
B. (Stirred).....	.192	.676	.936	1,363.76	1,312	3.79	92.88

The table indicates slightly more acid on the curd not stirred at the time of milling, but practically the same as the normal curd at salting time. The yield of marketable cheese was 45 lbs. more from the 29,135 lbs. milk used, or at the rate of 1½ lbs. cheese per 1,000 lbs. milk by not stirring the curd, at the time of dipping. This difference in weight might be due to differences in weight of curd at the time of dividing. (See fourth series for effect on yield of cheese.) The shrinkage was slightly greater on the cheese from the curds not stirred. The quality of the cheese was practically the same from both lots.

The difference in the percentages of moisture in the curds and cheese is shown in the next table:—

———	Curd at Dipping.	Green Cheese.	Ripe Cheese.
A (not stirred).....	55.17	35.56	35.49
B (stirred)	48.19	34.90	34.45

The A curds contained about seven per cent. more moisture at the time of dipping than did the B lots which were stirred. There was not much difference in the moisture of the lots of green and ripe cheese.

The second series of experiments was made by dividing a curd into three lots—one not stirred at all, one stirred about half the usual amount and one given the usual amount of stirring. For these tests 6,881 lbs. milk, testing an average of 3.56 per cent. fat, were used. The milk was handled in one

vat up to the time of dipping, when it was divided into three equal parts as nearly as possible. The whey tested an average of .23 per cent. fat. The main points in these three experiments are shown in the table:—

Curd.	Per cent. acid at salting.	Weight of Cheese.		Per cent. Shrinkage.	Score Max. 100.
		Green.	Ripe.		
		lbs.	lbs.		
A (not stirred)	.93	217.69	209.	3.9	91.50
B (stirred one-half)	.92	214.50	206.	3.8	91.41
C (normal)	.90	222.32	215.	3.3	91.58

Here again differences in weight of cheese may be due to differences in weight of curd at the time of dividing the curds, which were not weighed. The percentage of shrinkage was least in the curds stirred to a normal condition. There was little or no difference in the quality of the cheese from the respective lots.

The percentages of moisture in curds and cheese were:—

Curd.	Curd at Dipping.	Green Cheese.	Ripe Cheese.
A (not stirred)	52.26	35.6	35.33
B (½ stirred)	50.00	35.33	35.33
C (Normal)	47.60	35.0	34.80

The third phase of the experiments on the moisture work related to the effect of leaving a larger curd without stirring. These curds were from vats of milk ranging in weight from 1,244 to 2,471 lbs., and averaged 1,590 lbs milk for each experiment. The fat in the milk and whey averaged 3.66 and .2%, respectively. The percentages of acid at dipping, milling and salting averaged respectively, .195, .74, and .992. The percentages of moisture were 52, 35.6 and 35.6 for the lots at dipping, green cheese and ripe cheese. The weight of marketable cheese was 606 lbs. The shrinkage averaged 3.7 per cent., or about the same as in the other experiments of the series. The yield of cheese averaged 95.2 lbs. per 1,000 lbs. milk. The average score was 92.12 points out of 100. The cheese seemed to be slightly more open than our regular cheese, otherwise they were little or no different from our regular make.

The fourth series, consisting of six experiments, was made by mixing 6,170 lbs. milk, testing an average of 3.68 per cent. fat. The milk on these six different occasions, after thorough mixing and adding culture and coloring, was divided equally between two vats. They were handled as nearly alike as possible up to the time of dipping when one curd (A) was not stirred and the other (B) was given the usual amount of stirring. The average percentages of acidity and moisture are shown in the table:—

Kind of Curd.	Percentage of acid at			Percentages of moisture in		
	Dipping.	Milling.	Salting.	Curd at Dipping	Green Cheese.	Ripe Cheese.
A (not stirred)	.191	.695	.945	56.8	36 53	35.06
B (stirred)	.192	.678	.893	49.4	35.60	35.53

The average yield of cheese per 1,000 lbs. milk was 94 lbs. from the lots not stirred and 93.6 in those experiments where the usual amount of stirring was given at the time of dipping. There was little difference in the quality of the cheese. The average total scores were 92.66 and 92.9, respectively, for the lots not stirred and those stirred in the usual way.

The fifth series was conducted similar to that of the fourth, except that in the fifth the A lots (not stirred) were dipped with less acid than usual and with less than was given to the B lots. There were five experiments on this point, for which were used 4,872 lbs. milk testing 3.51 per cent. fat. The whey from the A lots tested an average of .21 and that from the B lots .215 per cent. fat.

The percentages of acid and moisture are shown in the table:—

Kind of Curd.	Percentage of acid at			Percentage of moisture in		
	Dipping.	Milling.	Salting.	Curd at Dipping	Green Cheese.	Ripe Cheese.
A (less acid and not stirred)..	.174	.694	.938	54.4	36.2	36.05
B (normal)	.19	.662	.93	48.2	35.4	34.9

The average yields of cheese per 1,000 lbs. milk were 91.9 from the lots dipped with a low percentage of acid and not stirred, while from the normal lots it was 91.5 lbs. marketable cheese. The average scores of the cheese were 92.8 for the A lots and 92.5 for the B lots.

The lots dipped sweet and not stirred contained more moisture (one per cent.), gave a greater yield of cheese (about one-half pound per 1,000 lbs. milk); and scored slightly higher in quality than did those lots treated in the usual way.

Percentages of Moisture Lost in Curd and Cheese at Different Stages of Making.

Last year we did some work to find out the percentage of moisture lost in curd and cheese at the stages of dipping, milling, salting, green and ripe cheese, where curds were not stirred and where they were stirred in the usual way. The work was continued during 1908 with the following results:

The curds not stirred lost 27.3 per cent. of the moisture contained at the time of dipping, by the time the milling stage was reached; 3.3 per cent. between milling and salting; 9.8 per cent. between salting and green cheese; 2.4 per cent. between green cheese and the marketable stage, when the cheese were two weeks to one month old.

The normal curds lost 19.6 per cent. of their moisture between dipping and milling; .8 per cent. between milling and salting; 11.1 per cent. between salting and green cheese and less than one per cent. between green cheese and marketing. (It is difficult to account for the apparent very slight loss of moisture between the cheese in the green stage and at the time of marketing, in a number of experiments, unless the moisture be unevenly distributed in the cheese causing an error in sampling.)

Conclusions.

1. Where curds out of the same vat of milk were divided into two equal parts as nearly as possible—one-half not stirred and the other stirred as usual—the curds from the lots not stirred contained about seven per cent.

more moisture at the time of dipping, but the difference in moisture of the marketable cheese was only about one per cent. There was little or no difference in the quality of the cheese.

2. In the case of dividing a curd into three lots—one not stirred, one given about half the usual amount of stirring and one part stirred in the usual way—we found very little difference in the moisture of the ripened cheese from the three lots, while the quality is practically the same throughout all the experiments.

3. Where a larger curd, in some cases from about 2,500 lbs. milk, was placed on the drainer without any stirring, the yield and quality of the cheese was quite satisfactory. Our supply of milk for cheesemaking did not allow us to make any comparative tests with similar milk in these experiments.

4. Where smaller weights of milk were made up in two vats after thorough mixing, there was an average increase of nearly one-half pound of cheese per 1,000 lbs. milk by not stirring the curd at the time of dipping. The quality of the cheese was very similar from both vats.

5. Dipping the curds comparatively sweet (about .17% acid) and not stirring them after dipping gave very satisfactory results in yield and quality of cheese.

6. The average of twenty-four experiments where curds were not stirred gave 55.062 per cent. moisture in the curds at the time of dipping. Similar experiments where the curds were stirred, averaged 48.468 per cent. moisture at dipping. The average difference was 7.594 per cent. more moisture in curds at the time of dipping as a result of not stirring.

In the green cheese the average percentages of moisture in the twenty-four lots from curds not stirred was 35.664, and from the lots stirred in the usual way the moisture content of the green cheese averaged 34.877—a difference of .727 more moisture by not stirring.

The marketable cheese from curds not stirred showed an average of 35.017 per cent., while the lots from stirred curds tested an average of 34.771 or .246 per cent. more moisture.

The result of this, and previous years' work, indicate that the curd at the time of dipping may contain from five to seven and one-half per cent. more moisture as a result of not stirring, but the cheese when sold do not seem to have more than $\frac{1}{4}$ to $\frac{1}{2}$ per cent. more moisture as compared with cheese from curds stirred "dry." The advantage of not stirring lies in the saving of labor and the saving of milk solids remaining in the cheese after the moisture has evaporated.

Milk Coagulating Agents for Cheesemaking.

This is a continuation of the experiments reported on last year wherein we endeavoured to find a coagulating agent which would precipitate more of the milk solids than is done by the use of rennet, the common agent. In previous years we reported on work done with pepsin, an agent that was supposed to be superior to rennet. The manufacturers of pepsin claimed that it was really the pepsin in rennet which coagulated the milk and they argued that if this be true, why not use the pure pepsin instead of the diluted material in the form of rennet.

Last year we reported on the work done with an agent we called R A_2. We continued the work this year with this substance and also with other mixtures, but the results were not satisfactory. The percentage of solids left

in the whey with all these was slightly greater than the solids left in the whey by using rennet for coagulating the milk. The yield of cheese was also slightly less (.6 lbs. per 1000 lbs. milk) from the new agents as compared with rennet. The average quality of the cheese was slightly better in those lots made by using agents other than rennet or mixed with rennet. It looks as if we should have to depend upon rennet for coagulating milk in the process of cheesemaking, although it does seem as if we should be able to discover something which would precipitate more than half the milk solids which is about the proportion recovered at present.

Milk Solids Lost in Making Overripe Milk into Cheese.

These experiments are a continuation of the work done last year in conjunction with the Chemical department: We did not give the results of last year's work because they were so different from what is the commonly accepted belief regarding the effects of handling milk which is overripe for cheesemaking. As we got similar results during the past season we may give these and they will serve to indicate the general trend of the experiments conducted during the past two years. We pointed out last year the difficulties in the way of making a satisfactory test of the problems involved. If we took normal milk one day and compared results with "fast" milk the next, or the previous day, many other factors might enter into the problem. This, however, is the manner in which the average cheesemaker would arrive at his conclusions, and it is the plan followed by us in most of the experiments. A few tests were made by dividing a vat of milk into two lots and allowing one-half to become overripe in the vat, while the other half was handled as a normal curd. This is the more accurate method, but the "practical" man objects, saying, "this is not the way the milk becomes sour in ordinary factory work, and you ought, so far as possible, to have the conditions similar to those found at the factory." As previously noted we tried both plans, but the results were not very satisfactory in either case, *i.e.*, the loss of milk solids in the whey was about the same from both normal and fast-working milk.

During the past year five experiments were made comparing overripe milk as delivered by patrons, with normal milk delivered by the same patrons on succeeding days. The curds from the lots of overripe milk remained in the whey an average of 53 minutes. The yield of ripe cheese per 1,000 lbs. milk was 91.3 lbs. The average score of these cheese was 93.3. The total solids in the milk averaged 12.16. The solids in the whey averaged 6.8 per cent.

The curd from the normal lots were in the whey an average of 2 hours and 55 minutes. The yield of cheese per 1,000 lbs. milk was 94 lbs. The average score of the cheese was 95. The milk averaged 12.24 per cent. solids, while the whey contained 6.71 per cent. solids—or an average of but .09 per cent. less than did the whey from the overripe milk.

Two tests were made for the moisture in the curds at the time of dipping, and in the green and ripe cheese. There was very little difference at these stages—in the ripe cheese the percentages of moisture was the same for both lots, viz., 34.6. Similar results were got in the case of an experiment made, wherein a lot of milk was divided into two equal parts. One-half was normal and the other was allowed to become overripe. The solids in the milk were 11.889 per cent. The solids in the whey from the normal lot was 6.67 per cent., and in the whey from the overripe milk it was 6.66 per cent. The normal curd remained in the whey for 2½ hours, while the overripe

curd dipped in 50 minutes. The whey from the normal lot tested .23% fat and the other .25%. The yield and quality of the cheese were the same from both lots.

All the curds from the fast working milk were cut with a fine wire perpendicular curd knife and the normal curds with the regular 3-8 inch blade knives.

Fine vs. Coarse Wire Curd Knives.

Last year we pointed out the tendency towards the use of wire perpendicular curd knives instead of the steel blades so long in use. We also said that the tendency was to have the wires about 3-8 inch apart, instead of ¼ to 5-8 inch, as in the case of the ordinary blade knives. We mentioned that as a result of the experiments conducted with "fast-working" milk, a "knife made of fine wire and having the wires ¼ inch apart is evidently an improvement over the regular form of curd knife. The advantages are, less loss of fat in the whey and an increased yield of cheese, amounting in these experiments to nearly one pound of cured cheese per 1,000 lbs. milk."

Experiments were also reported on last year comparing the ⅜ inch wire curd knife with a blade knife of similar size for cutting curds from normal milk. There was a slightly greater loss of fat in the whey from the curds cut with the wire knife, but this was probably due to the wires being too coarse.

During the past season experiments were made with curds from normal milk comparing a perpendicular curd knife made of fine wire and having the wires ¼ inch apart, with a coarser wire knife having the wires ⅜ inch apart.

Fifteen experiments were made. Altogether there were 12,822 lbs. milk used, testing an average of 3.71 per cent. fat. The whey from the lots cut with the fine knife tested an average of .23 per cent. fat. From the lots cut with the coarser wire knife, the average percentage of fat in the whey was .26. Each lot of milk was divided into two equal parts and placed in separate vats. All other points, except the cutting of the curd, were alike so far as possible. Both vats were cut once with the horizontal ⅜ inch blade knife, then each was cut twice with the respective wire knives. The total yield of green cheese from the lots cut with the fine wire knife was 640.23, and from the lots cut with the coarser knife, 644.63. The ripened cheese weighed respectively 611 and 614 lbs. The percentage of shrinkage was 4.5 in the lots cut with the fine knife and 4.7 in the coarse wire lots. The yield of ripened cheese per 1,000 lbs. milk was 95.3 and 95.7 lbs. respectively from the fine and coarse wire knives. The average score of the lots of cheese was 93.6 and 93.9—being slightly higher for the cheese made by using the coarser knife.

It is difficult to account for the increased yield of cheese by using the coarse knife, except that the latter cheese may have contained more moisture. Only two lots of such were tested for moisture. The average results were:

Percentage of Moisture in Curd and Cheese.

—	Dipping.	Green Cheese.	Ripened Cheese.
¼ inch knife	49.5	35.	34.
⅜ inch knife	48.5	35.2	34.3

These two tests indicate about one per cent. more moisture in the curds at the time of dipping when the fine knife was used, but the green and ripened cheese from these lots had slightly less moisture. Assuming that the average of these two tests represents the average difference in moisture of all the experiments, it would not account for all the difference in yield of green and ripened cheese. In the green cheese from the lots cut with the coarser knife the difference in moisture would account for about 1¼ lbs., whereas the actual difference was nearly 4½ lbs. In the ripened cheese, the increased moisture in these lots which were tested would account for less than two pounds, whereas the actual difference in yield was 3 pounds in favor of the coarser knife.

These experiments will need to be repeated before drawing definite conclusions.

Methods of Pressing Curds.

The common method of pressing curds is to tighten the press gradually during about the first three-quarters of an hour after putting the curd in the hoops, and again during the first two or three hours, after what is known as "dressing" the cheese. Full pressure is then applied to the cheese. The object of the experiments made in this connection was to see whether light pressure continued during two days would give better results; and also to see whether or not any ill effects resulted from applying full pressure at once to the curd after placing it in the hoops and to the cheese after dressing. Only one experiment was made by testing the effects of long, light pressure as we did not get a second press until late in the season. As we were using our regular press every day; it was necessary to have another press for these experiments. Altogether seven experiments were made comparing normal methods of pressing with applying full pressure on the cheese at once. The cheese were left in the press about three-quarters of an hour before "dressing" and for twenty hours after "dressing." They were turned in the hoops the morning after making the cheese.

Normal vs. Gradual Light Pressure.

On August 6th, 492 lbs. milk testing 3.6 per cent. fat, the whey from which tested .2 per cent. fat, was made into curd, which was divided into two equal parts at the time of putting the curd into the hoops. The A cheese was pressed in the usual way. The B cheese was pressed very lightly and gradually until August 8th, or for forty-eight hours. The weights of green cheese were 23¼ and 23½ lbs. respectively. The weights of commercial cheese were 21 and 22 lbs.—or an increase of one pound of cheese from the curd pressed lightly for about double the usual length of time. Both curds scored exactly the same in all points.

The percentage of moisture in the curd at dipping, in green and ripe cheese were as follows:

	Curd.	Green Cheese.	Ripe Cheese.
A	48	35.2	34.6
B	48	34.8	33.8

Too much stress cannot be laid upon the results of one experiment, but the results indicate that light, gradual pressing produces more cheese, and that both the green and ripe cheese contain slightly less moisture as compared with normal pressing.

Normal vs. Heavy Pressure Applied at once to Curd and Cheese

For these seven experiments there were used 4,000 lbs. milk averaging 3.83 per cent. fat. The average percentage of fat in the whey was .18. Each lot of milk was handled as one curd up to the time of putting to press. The A lots were pressed in the usual way, while the B lots had full pressure applied at once before and after "dressing." The moisture in curd and cheese was determined in but one lot on August 11th. The curd at dipping contained 49.8 per cent. The green cheese contained 34.8 and 34.6 per cent., for the A and B lots. The ripe cheese contained 34.4 and 34.2 per cent. moisture, respectively. The A lots shrank 5.4 per cent. during the ripening period; while the B lots shrank 5.6 per cent. The average score of the cheese was:

	Flavor.	Closeness.	Even Color.	Texture.	Total.
	Max. 40	Max. 15	Max. 15	Max. 20	Max. 100
A.....	37	13.87	14	18.43	93.32
B.....	37.2	13.81	14	18.62	93.56

There did not appear to be much difference in yield or quality of cheese from the two methods of pressing. Further experiments are needed before drawing conclusions.

Preservative in Cheese.

Two experiments were made to note the effect, if any, of adding one quarter per cent. of borax to curds at the time of adding the salt. The borax was mixed with the salt and both were applied at the same time. One lot of cheese was kept for two months (one week in the ordinary ripening room and the remainder of the time in cold storage) and were scored twice during that time. The other lot was scored once at the usual time—about one month after making. Mr. Frank Herns, Chief Instructor for Western Ontario, scored these lots the first time on May 6th. They were scored the second time on June 13th, by all the Western Instructors who met at the Dairy department of the College on that date. The following table shows the details of the scoring:

Kind of Cheese.	Date of Scoring.	Flavor.	Closeness.	Even Color.	Texture.	Total.
		(40)	(15)	(15)	(20)	(100)
Normal.....	May 6.....	37	14	14	16.5	91.5
"	June 13.....	36	14.25	14	16.5	90.75
Preservative....	May 6.....	37	14	14	17	92.
"	June 13.....	35	14.25	14	16.75	90.
Normal.....	Av. all scores	36.3	14.08	14.16	16.8	91.4
Preservative..	both lots	36.	14.08	14.16	17.08	91.3

It will be noticed that the normal lot lost one point in flavor from May 6th to June 13th, while the lot with preservative in it lost two points in flavor. When we average all the scores given the cheese in both experiments we find very little difference in general quality, and conclude that under these conditions preservatives have little or no effect upon cheese.

EXPERIMENTS IN BUTTERMAKING.

Effects of Temperature of Wash Water on Moisture Content, Yield, and Quality of Butter.

These experiments are a continuation of the work done during three previous years. Six trials were made comparing the effects of washing butter with water at a temperature of 50 degrees F., and washing butter from similar lots of cream with water at a temperature of 58 degrees F. These tests were all made during the month of April and May. The average sized churning was 307.5 lbs. cream, testing 23.7 per cent. fat. The average churning temperature was 54.5 degrees F., and the time required for churning was about 33 minutes. The total pounds of butter made from the lots washed with water at 50 degrees F., was 515.5. The butter from the lots washed with water at 58 degrees F., weighed 517.5 lbs.—a gain of two lbs. butter on a total of 1.845 lbs. of cream containing 435.5 lbs. fat. The overrun from the lots washed with water at 50 degrees averaged 18.3 per cent. The lots washed with water at 58 degrees gave an overrun of 18.8 per cent.—half a per cent. more than did the previous lots. The relative percentages of moisture in the butters were, 13.65 and 13.83—a difference of one-half per cent. more in the lots washed with water at the higher temperature.

Quality of the Butter.

The average quality of the lots of butter was very similar as shown in the table:

Kind of Butter.	Flavor.	Grain.	Color.	Salt.	Package.	Total.
	(50)	(20)	(15)	(10)	(5)	(100)
Washed at 50°F. 1st score..	43.9	19.1	14	10	5	92.0
2nd "	40.	19.5	13.8	10	5	88.3
Washed at 58°F. 1st score..	43.95	18.95	13.4	10	5	91.30
2nd "	39.9	19.37	13.7	10	5	87.97

Influence of Size of Churning on Moisture Content of Butter.

This is a continuation of the work done last year. Eight experiments were made with small churnings which averaged 225 lbs. cream each, testing 25.3 per cent. fat. The seven larger churnings averaged 358.8 lbs. cream each. All churnings were made in a small-sized Simplex churn. The average churning temperature was about 55 degrees F. The average time required to churn the small lots was 22 minutes; and that of the larger lots 31.7 minutes. The buttermilk tested .19 per cent. fat for both. The per cent. overrun was 19.37 for the small churnings and 19.33 for the larger. The percentage of moisture in the butter from the two lots was 13.91 and 13.88 for the small and larger churnings.

The scoring of the butter were as follows:

Kind of Butter.	Flavor.	Grain.	Color.	Salt.	Package.	Total.
	(50)	(20)	(15)	(10)	(5)	(100)
Small Churnings. 1st score.	44.8	19.68	13.8	10	5	93.28
2nd "	42.3	19.18	13.6	10	5	90.08
Larger " 1st "	44.8	19.5	13.8	9.9	5	93.0
2nd "	42.4	19.3	13.7	10	5	90.4

These scorings indicate little or no difference in the quality of the butter when fresh, or after being kept for a month or more in the refrigerator.

Experiments to Ascertain if Uniform Moisture Content of Butter is Practicable by Following one Method.

This also is a continuation of the work done last year to find out how close to a uniform percentage of moisture may be got in butter by following a uniform plan or method. Last year the range of moisture in the different lots of butter was from 13 to 15 per cent. where one plan was followed as closely as possible on several different churnings. We were able to make but four trials this year. The results were that a much more uniform moisture content in the butter was obtained than was got last year. The average pounds of cream in each churning was 286, testing 23 per cent. fat. The churning temperature was 55 degrees F.; time required for churning 28 minutes; the temperature of the wash water averaged 60 degrees F. The butter was given an average of 13 revolutions of the worker in the Simplex. The pounds of butter averaged practically 78, per churning. The percentage of overrun for individual churnings ranged from 17.5 to 21.25. The percentage of moisture in the butter from the individual churnings ranged from 13.5 to 14.15 and averaged 13.85 for the four trials.

The quality of the butter was quite uniform for all the lots, hence it is not necessary to give the detailed scorings for the different churnings.

Conclusions.

1. The lots of butter washed with water at a temperature of 58 degrees gave an increased overrun of about one-half per cent., as compared with lots washed with water at 50 degrees F., in the months of April and May. This extra overrun appears to have been practically all extra moisture in the butter, as the tests for moisture indicated about one-half per cent. more water in the lots washed in water at the higher temperature. There was little or no difference in the quality of the butter, either when fresh or when held for a month or more.

2. Under the conditions given, the size of the churning did not appear to influence the moisture or quality of the butter made.

3. The results this year of a uniform method of churning and working butter showed more uniform results in the moisture content of the butter as compared with last year, but the overrun varied nearly four per cent. in individual churnings. As stated in previous years we have not found a constant relation between overrun and moisture content of the butter.

Pasteurization of Sour Cream, with and without Culture (Starter) added after Heating and Cooling.

We were able to make but one experiment on this interesting phase of creamery work. We hope to be able to continue this work next year as it is a live question among creamerymen. Will it pay to pasteurize sour cream? is a question asked very frequently. A number of creameries adopted the plan and then discontinued it, thinking it did not pay. Some buttermakers are of the opinion that it causes too great a loss of fat in the buttermilk, while others, because of the lack of proper cooling facilities, thought it made too much labor for any improvement there might be in the quality of the butter.

On May 27th, 732 lbs. sour cream was divided into three lots of 244 lbs. each, testing 26.5 per cent. fat. The first lot was held over night and churned the next day without pasteurizing. This amount of cream made 77 lbs. butter. The overrun was 19.08 per cent. The buttermilk tested .23 per cent. fat.

The second lot of cream was pasteurized in the afternoon at a temperature of about 180 degrees F.; ten per cent. of culture was added and the next day it was churned at a temperature of 55 degrees F. The buttermilk tested .24 per cent. fat. The yield of butter was 75.75 lbs.—an overrun of 17.15 per cent., or about two per cent. less than from the lot unpasteurized.

The third lot was also pasteurized and held over night, but no culture was added to the cream. The buttermilk tested .45 per cent. fat, but the yield of butter was the same (75¾ lbs.) as for the lot pasteurized and having culture added.

The quality of the butter from the three lots of cream is shown in the table. The first scoring was made on June 13th, and the second, October 15th, or nearly five months after the butter was made.

The average temperature at which samples of the butter was kept in print form would be about 45 degrees F., in an ice cold-storage.

Kind of Butter.	Flavor.	Grain.	Color.	Salt.	Package.	Total.
	(50)	(20)	(15)	(10)	(5)	(100)
Unpasteurized 1st score	40	17.5	12.5	10	5	85
2nd "	30	20	14	10	5	79
Average	35	18.75	13.25	10	5	82
Past. & 10 p.c. culture 1st score	41.5	18	13	10	5	87.5
2nd "	32	20	14	10	5	81
Average	36.75	19	13.5	10	5	84.25
Past. and no culture 1st score	41.5	18	13	10	5	87.5
2nd "	35	20	14	10	5	84
Average	38.75	19	13.5	10	5	85.75

Conclusions.

It is not wise to draw conclusions from one experiment, but the results indicate a greater yield of butter from the raw cream. The quality of the butter made from the raw cream was not so good when first made, neither did it keep so well as that made from the lots pasteurized. The lot without culture seemed to hold its flavour better than did that with culture added to the cream after pasteurizing.

Borax vs. Commercial Preservative.

One of the creamery instructors is of the opinion that borax, which had been recommended by us as a preservative to be used in butter, had a tendency to make the butter more "greasy" in texture as compared with the commercial forms of preservatives. A lot of cream (400 lbs.) was divided on May 9th, into two equal parts and churned. The cream tested 24 per cent. fat and was treated in the usual way up to the time of salting. On the

butter from the one lot of cream was sifted 4 ounces of powdered borax. On the butter from the other lot was sifted 4 ounces of commercial preservative. Both lots were then worked in the usual way and samples kept for scoring purposes. The lots were scored on June 13th and again October 15th, having been kept in an ice cold storage at about 45 degrees F., in the meantime. The average of both scorings in grain was 19.25 for the borax lot and 19. for the commercial preservative lot. The average total scores were 89.25 and 90.25 for the borax and commercial preservative lots respectively.

Conclusion.

The butter in this experiment did not show any marked differences in grain or general quality from the use of the two kinds of preservatives. In previous years we have not seen any marked difference in the grain of butter by using the various kinds of butter preservatives on the market. All saltless butter appears more or less "greasy" in texture and "dead" in color.

Respectfully submitted,

H. H. DEAN.

PART X.

THE PROFESSOR OF BACTERIOLOGY.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to submit the following report upon the work of this department for the year ending November 30, 1908.

INSTRUCTION. Lecture and laboratory courses were conducted for College, Macdonald, and Short-course students, as required by the College calendar. The courses for the senior and sophomore classes were made to consist of laboratory work instead of lectures only, as has been the custom in previous years. It was found, however, that in the present insufficient laboratory accommodation, laboratory work for these two classes could not be conducted successfully, and the project was abandoned at the beginning of the present school year. Two special lectures on canning of fruits and vegetables were given to Domestic Science classes of Macdonald Institute. Six periods of laboratory demonstrations were held for students attending the summer school. Two half-day periods were spent with the Ontario Dairy Instructors on various problems of the creamery and cheese factory.

At the present time, two members of the senior year are taking the Bacteriology option, and special instruction has been given to two other students during the year.

MEETINGS ATTENDED. I attended the annual meeting of the Society of American Bacteriologists, at Chicago, last December, and the International Congress on Tuberculosis held in Washington in October.

PUBLICATIONS. The results of our work during 1906 and 1907 on the preparation and distribution of nitrogen-gathering bacteria for inoculating seeds of legumes were published in March as Bulletin 164. One press bulletin was issued, papers contributed for the College Nature Study bulletin, and the annual report of the Farmers' Institute, and to agricultural papers. A paper on "Tuberculosis Among Farm Animals" was given before the special students in the live stock and seed courses last winter. At the request of Dr. C. E. Marshall, of Michigan Agricultural College, I have made two contributions to a series of papers on laboratory technique being edited and published from the Bacteriological Laboratory of that college.

ROUTINE LABORATORY WORK AND ANALYSES. During the year we prepared and sent eighty-six lactic starters for creameries and cheese factories.

The widely diversified nature of the laboratory work may be noted from the following summary of analysis and examinations of specimens submitted by farmers and others during the year:

SPECIMENS EXAMINED, 1908.

Anthrax	1	Egg	1
Blood	1	Milk	26
Calf	1	Mutton	1
Canary	1	Pigs	3
Cheese	4	Plant diseases	9
Diseased hens	35	Pus	1
" chicks	5	Sputum	10
" duck	1	Tumor	1
" wild gander	1	Water	10
" " goose	1		
" turkey	1	Total	118
" organs	4		

Legume Bacteria.

The distribution of cultures of legume bacteria was continued, two thousand one hundred and thirteen cultures being sent to nine provinces of the Dominion and to five other countries. Six hundred and thirty-four reports from farmers were received and the summary of results appears in the following table. The plus columns indicate the reports in which positive benefit resulted from inoculation of the seed, and the minus columns show those in which no benefit was apparent.

Results of Seed Inoculation, 1908.

	Alfalfa		Red Clover		Alsike Clover		Peas		Beans		Sweet Peas	
	+	−	+	−	+	−	+	−	+	−	+	−
Ontario	261	140	43	42	9	5	9	16	4	4	2	1
Percentage	65	35	50.5	49.5								
British Columbia	11	3	5	1							1	
Percentage	78.5	21.5	83.3	16.7								
Alberta	10	8	1				2					
Percentage	55.5	44.5	100									
Quebec	10	6									1	
Percentage	62.5	37.5										
P. E. Island	4	1	1									
Percentage	80	20	100									
Saskatchewan	3	1					1					
Percentage	75	25										
Nova Scotia	4	3	2	1	1		1	1			1	
Percentage	57	43	66.7	33.3								
New Brunswick	3	1	1									
Percentage	75	25	100									
Manitoba	3	2	2									
Percentage	60	40	100									
United States				1			1					
Percentage				100								
Total	309	165	55	45	10	5	14	17	4	4	5	1
Percentage	65	35	55	45	66.7	33.3	45	55	50	50	83.3	16.7

Cultures for inoculating seed will be sent during the coming season for seed of the following crops:—Alfalfa, red clover, alsike clover, peas, beans, sweet peas, vetches. The laboratory prepares but one size package of culture, that being sufficient for 60 pounds of seed, and a nominal price of twenty-five cents is charged for each package to cover cost of preparation, postage, etc. Each kind of seed requires a different kind of culture. All applications should state the kind of seed on which the culture is to be used, the number of cultures desired, and as near as can be judged the date of seeding. Remittance may be in any convenient way and should be sent with applications to S. F. Edwards, O.A.C., Guelph, Canada.

Research. Most of our available time for research has been spent in further studies of the nitrogen-accumulating bacteria of the legumes. The results of these studies are now nearly ready for publication.

Mr. Barlow conducted some investigation on cucumber wilt, besides co-operating in the studies above mentioned.

Considerable time was spent during the year in further studies of the disease of incubator chicks known as "white diarrhoea". Observations on this disease are still being made.

Fig. 1. Liver of hen that died of tuberculosis. Nearly natural size.

During the summer Mr. B. Barlow resigned his position as lecturer in Bacteriology on account of ill health, and his place was taken by Mr. D. H. Jones, one of last year's graduates of this College, who is already proving a valuable member of the laboratory staff.

Tuberculosis of Fowls.

One phase of our laboratory work which deserves the attention of Ontario farmers is the comparatively large number of cases examined of tuberculosis of the common barnyard fowls. During the past year, we have had sent to this laboratory from various parts of the Province, nineteen fowls affected with tuberculosis. This in itself is not a large number, but it is an increase of fifty-three per cent. over any previous year, and is

one more than the total number sent in during the previous four years. Prof. Graham, of the Poultry Department, states that he receives an average of a letter a week from farmers describing disease in their flocks, the symptoms of which point unmistakably to tuberculosis. We receive a number of similar letters.

These facts indicate that this disease is widely prevalent in Ontario, and the farmer or poultry raiser should familiarize himself with the disease, so that when he finds it in his own flock he will be able to cope with it intelligently and effectively.

Tuberculosis may exist extensively among fowls, especially in large flocks, but seldom kills enough birds at any one time to draw particular attention of the owner to the trouble. Many farmers say they have been losing a bird or two occasionally for a year or more, and that the loss is gradually increasing. The loss constitutes a steady drain, yet is not large enough at any one time to awaken the farmer to a realization of what the total loss would amount to in a series of years. Nor is the loss always a gradual one.

Fig. 2. Two tubercular spleens from fowls dead of tuberculosis, and a spleen from a healthy fowl. Natural size.

Within the last few months, two farmers have sent tubercular fowls, and each stated that he had lost about a hundred from the same disease within two years. A third said he had lost about one a week for over a year.

Tuberculosis of birds is confined mostly to chickens, although other fowls may contract the disease. Two interesting cases were examined in our laboratory last year in wild geese which had been kept for some time in captivity. Both were found to be badly affected with tuberculosis, and we transmitted the disease from these cases to chickens. Pheasants, turkeys, and pigeons may be affected. Authorities differ in their opinion as to the susceptibility of ducks. Singing birds in captivity are said to be highly susceptible.

Symptoms. There is no noticeable symptom of tubercular infection until the disease has progressed far enough to cause emaciation, which is nearly always present and which in advanced cases is extreme. Pernot, of the Oregon Experiment Station, described a case in which a Plymouth

Rock hen originally weighing four pounds was reduced in weight to twenty-two ounces. The comb and wattles and skin about the head usually become pale. Emaciation is usually accompanied by lameness, and there is nearly always a persistent diarrhoea, the feces appearing yellowish or greenish white. In the latter stages of the disease the feathers become ruffled, and the fowls are weak, more or less mopy and move about but little. The eyes are bright in most cases until death is near. The appetite is good throughout the sickness, and the fowls usually eat ravenously until a few days before death.

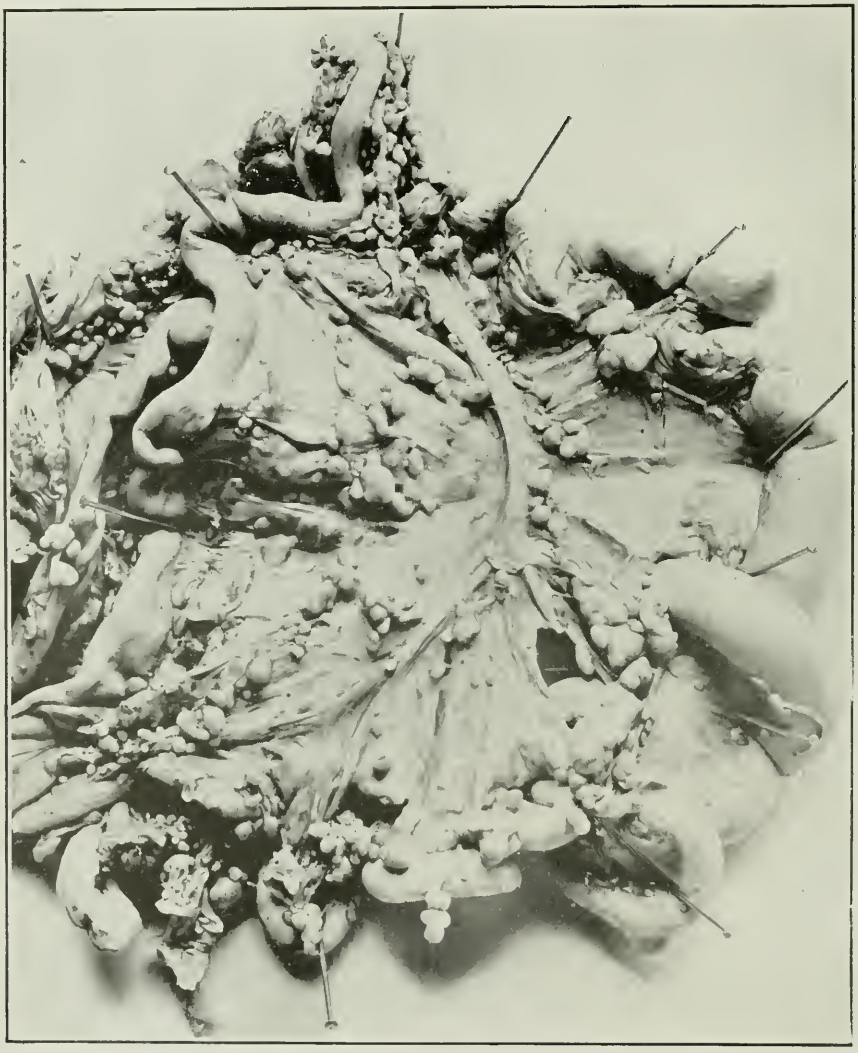


Fig. 3. Tuberculous mesentery of a fowl. (From Moore, "The Pathology of Infectious Diseases of Animals".) By permission.

Post-mortem Appearance. The lesions are widely distributed and vary much in their location in different individuals. The liver is almost invariably affected. It is usually enlarged and studded more or less abundantly with yellowish-white nodules of a somewhat cheesy consistency, vary-

ing in size from a pin head or even smaller to one-quarter inch or more in diameter. (See fig. 1.) The nodules protrude more or less, and may be readily separated from the surrounding liver tissue. The lesions vary in this respect from those of blackhead, in which disease the lesions are sunken below the surrounding tissue, are more yellow in color, and may be much larger. We have in some cases found a mixed infection with tuberculosis and blackhead in the same organ. The spleen, in health, a small, rounded, purple organ about half an inch in diameter, is frequently affected, and in consequence is greatly enlarged, sometimes to three or four times the original size, and contains nodules of the same character as those in the liver. (See fig. 2.) The intestines may be affected, in which case rounded masses of varying size will be found in the intestinal walls.

The mesentery, the thin membrane to the border of which the intestine is attached, is occasionally dotted with nodular masses. (See fig. 3.) The kidneys, lungs, spleen, ovaries, skin, and bones may be affected.

The table which follows shows the distribution of lesions in thirty-seven cases examined in this laboratory during the last five years, with date of examination. The X's indicate the extent of the infection. XXX indicates extensive infection with many nodules. XX indicates less extensive progress of the disease, and X indicates that only a few nodules were present.

Fowl No.	Died or Killed	Organs affected.								
		Liver.	Spleen	Intestine.	Mesentery	Lungs	Skin.	Muscles.	Pancreas.	Stomach.
1.....Aug. 1903.....	K	xxx	xxx	xxx	—	—	—	—	—	—
2.....Dec. 1903.....	K	xx	xxx	—	xx	—	—	x	—	—
3, 4.....Sept. 1904.....	K	xxx	xxx	—	—	—	—	—	—	—
5.....Jan. 1905.....	K	xxx	xxx	—	—	—	—	—	—	
6.....Feb. 1905.....	K	x	x	.....	.....	.....	.....	.....	.....	.....
7.....Feb. 1905.....	D	xxx	xx	—	—	—	—	—	—	—
8.....Feb. 1906.....	K	xxx	xxx	—	—	—	—	—	—	—
9, 10, 11..June, 1906.....	K	xxx	xxx	xx	x	—	—	—	—	—
12.....July, 1906.....	K	xxx	xxx	xx	—	—	—	—	—	—
13.....Dec. 1906.....	D	xxx	xxx	xxx	—	—	—	—	—	—
14.....Dec. 1906.....	K	xxx	xxx	xxx	—	—	—	—	—	—
15.....March, 1907.....	D	xxx	xx	xx	—	—	—	—	—	—
16.....Aug. 1907.....	K	xx	xx	—	—	—	—	—	—	—
17.....Aug. 1907.....	K	xx	—	xx	—	—	—	—	—	—
18.....Dec. 1907.....	D	xxx	—	—	x	xx	x	—	—	—
19.....Dec. 1907.....	K	xxx	—	—	x	xx	—	—	—	—
20.....Feb. 1908.....	K	xxx	xx	—	—	—	—	—	—	—
21.....March, 1908.....	K	xx	xx	x	—	—	—	—	—	—
22.....March, 1908.....	D	xxx	xx	xx	—	—	—	—	—	—
23.....March, 1908.....	K	xxx	xxx	xxx	—	—	—	—	—	—
24.....March, 1908.....	K	xxx	xxx	xxx	—	x	—	—	—	—
25.....April, 1908.....	D	xxx	xxx	xxx	xxx	—	—	--	xxx	—
26.....July, 1908.....	D	xx	—	—	—	—	—	—	—	—
27.....July, 1908.....	K	xx	xxx	xxx	—	—	—	—	—	xx
28..... Sept. 1908.....	K	xxx	xxx	xxx	—	—	—	—	—	—
29.....Sept. 1908.....	K	xxx	xxx	xxx	—	—	—	—	—	—
30.....Sept. 1908.....	K	xxx	xxx	xxx	—	—	—	—	—	—
31.....Sept. 1908.....	D	xxx	xxx	xxx	xx	xx	—	—	—	—
32.....Sept. 1908.....	K	xxx	xxx	xxx	xx	xx	—	—	—	—
33.....Oct. 1908.....	*	xxx	—	—	—	—	—	—	—	—
34.....Oct. 1908.....	D	xx	xx	—	—	—	—	—	—	—
35.....Oct. 1908.....	D	xx	xx	—	—	—	—	—	—	—
36.....Nov. 1908.....	K	xxx	xx	xx	—	—	—	—	—	—
37.....Dec. 1908.....	**	xx	x	—	—	—	—	—	—	—

* Liver only sent for examination.
** Turkey. Viscera only sent for examination.

Spread of Tuberculosis. Tuberculosis is caused by a minute bacterial organism, Bacterium tuberculosis of birds. (See fig. 4.) The bacteria gain entrance to certain portions of the body and multiply there, causing the formation of the nodules or tubercles seen on autopsy. The spread of the disease occurs when the bacteria are transferred directly or indirectly from the affected birds to the healthy ones.

If an examination is made of the tubercles occurring on the walls of the intestine, they will be found in many cases to have a cavity in the centre which communicates with the interior of the intestine. A microscopical examination of the intestinal contents at such points shows that enormous numbers of tubercle bacteria are present. The conclusion that the bacteria are liberated with the droppings is unavoidable. We have made microscopic examinations of the droppings in a number of cases and found the tubercle bacteria present. The droppings of tubercular fowls must, therefore, be regarded as one of the most important sources of infection of the

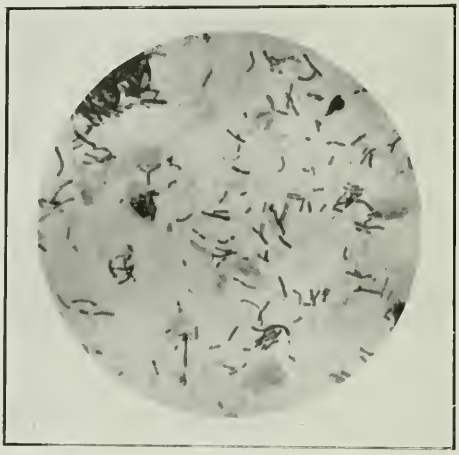


Fig. 4. Bacterium of tuberculosis from the lung tissue of a fowl. X 1,000.

healthy stock. The common farm practice of feeding from the ground or in low dishes or troughs, furnishes ample opportunity for the food to become fouled with feces, and one or two sick birds passing tubercle bacteria might easily serve to infect a large percentage of a flock. Although sunlight is rapidly fatal to this germ, it does not have opportunity to act freely on all infectious material. Indoors the bacteria may remain alive and dangerous for many weeks, and may infect the healthy birds. There is always the possibility also of carrying infected feces on the feet to food outside of the chicken house. Another dangerous practice, all too frequent, is that of leaving carcasses of birds that have died of tuberculosis to be eaten by the hogs or chickens.

The Control of Tuberculosis in Fowls.

There is no cure for tuberculosis in fowls, and attempted treatment is a waste of time and money expended for so-called remedies. The only course open is to adopt measures for eradicating the disease from flocks already infected, and for preventing future infection.

Eradication. The quickest and most effective method of eradicating the disease is to destroy all the fowls, and thoroughly disinfect the premises. In small flocks known to be infected with tuberculosis, this measure is advisable. The fowls could be examined and all that were found healthy could

be sold, thus lessening the loss considerably. In larger flocks, or when it is desired to preserve a certain strain in breeding, less drastic measures may be adopted with final satisfactory results. There is no known test to determine the presence of the disease until it has progressed so far as to cause lameness or emaciation. Ward, of California, has shown that tuberculin is of no value as a diagnostic agent for tuberculosis of fowls. There is good reason to believe that birds may be discharging the germs in the droppings, although the disease may not be far enough advanced to show noticeable symptoms. Hence all individuals of the flock must be regarded as dangerous to those free from disease, and the latter should be kept separate. All fowls suspected of having the disease should be slaughtered and the carcasses completely burned. Roosts, houses, etc., should be disinfected frequently. Inasmuch as affected birds may be continually distributing the bacteria in their feces, an occasional disinfection will be insufficient. No feed should be given the fowls on the ground. Feeding dishes or troughs should be frequently scalded with boiling water. It is not believed that this disease is transmitted through the egg. Hence if the young chicks are placed on ground not previously inhabited by the old stock, the chances are very favourable for rearing them free from tuberculosis. Care should be observed in purchasing new birds that they come from flocks which are free from disease. Experience on some of the large poultry ranches of California has shown that the transfer of laying hens is an important factor in the transmission of the disease. Poultry raisers should, as far as possible, raise their own stock.

Disinfection. The first thing to do in putting the poultry premises in sanitary condition is to scrape the roosts, walls, floors, and nests thoroughly clean. This loose rubbish, together with loose boards, etc., should be completely burned. When this has been done, the entire place should be whitewashed, with lime water—crude carbolic acid—solution, in the proportion of twenty gallons of lime water to one gallon of crude carbolic acid. Unslaked lime should be used mixed with enough water to give it the consistency of thin cream, and the carbolic acid then added. This mixture may be sprayed on or put on with a brush, due care being observed to see that every particle of surface in the poultry house is well covered. Coal tar disinfectants may be used alone in place of the above mixture, but they are more expensive and no more effective. After disinfection, clean boards may be placed beneath the roosts to catch the droppings, thus facilitating the work in future cleaning. Slaked lime placed on these boards will absorb the moisture from the droppings and will add to their fertilizing value.

There is no way of effectually disinfecting soil. The yards, however, should be kept as clean as possible and free from loose boards, and all unnecessary litter of any kind.

If there are occasional losses of fowls on the farm, and the cause is unknown, the birds should be examined after death for evidence of tuberculosis, as shown in the accompanying illustrations. If desired, specimens may be sent direct to this laboratory for examination. Such material should be securely packed and sent by prepaid express so as to reach its destination as soon as possible after the death of the bird. The specimens will be examined and reported upon without further cost to the sender.

Respectfully submitted,

S. F. EDWARDS.

PART XI.

THE PROFESSOR OF ANIMAL HUSBANDRY AND FARM SUPERINTENDENT.

To the President of the Ontario Agricultural College:

Sir,—I have the honour to submit herewith the report of my department, which will touch but briefly upon the principal items of general interest to the public.

In a College oat field.

Farm Crops.

The past season gave us very fair crops on the whole, though the dry weather of the latter part of the season caused some damage. The hay crop was fair, averaging about two tons per acre. Winter wheat produced a very heavy crop of straw, and the yield and sample were somewhat injured by lodging. The average yield will be fully forty bushels per acre. Oats are a good sample, and the yield will be in the neighborhood of fifty bushels per acre. The barley was seeded with alfalfa, and was sown at the rate of only one bushel per acre. As a result, the crop was somewhat light, and the sample not up to that of past years. As we have not finished threshing any of these crops, we cannot state the yield definitely. Mangels were a good crop, yielding nine hundred bushels per acre. Potatoes are free from rot and scab, and yielded slightly over two hundred bushels per acre. Corn was about up to the average with a yield approximating fifteen tons per acre. Turnips were practically a failure, being destroyed by the plant louse and some form of blight.

The Dairy Herd.

The dairy herd has been strengthened at several points during the year, and we now have reasonably good representatives of the Ayrshire, Holstein, and Jersey breeds.

Following is the record of the herd for the past year:

Record of Dairy Herd from December 1st, 1907, to November 30th, 1908.

Name.	Breed.	Age, Dec. 1, 1907.	Date of last calving.	Number of days milking.	Lbs. milk.	Average per cent. of fat in milk.	Lbs. of fat in milk.	Lbs. butter, adding $\frac{1}{6}$ to fat.	Value of fat at 25c. per lb.	Cost of feed.	Profit over cost of feed.
									$ c.	$ c.	$ c.
Molly DeK.	H.	6	Feb. '08.	298	12,963	3.3	429.06	500.57	107 26	54 48	52 78
Lady S. 2nd.	H.	4	Apr. '08.	337	11,458	3.45	394.92	460.74	98 72	45 41	53 31
Boutsje.	H.	5	Mar. '08.	331	11,665	3.33	388.61	453.38	97 13	51 45	45 68
Marjorie C.	H.	4	Apr. '08.	341	10,864	3.36	364.53	425.28	91 11	45 41	45 70
Abby M.	H.	7	Dec. '08.	272	9,730	3.6	349.91	408.23	87 46	46 59	40 87
Minnie of E. S.	A.	3	Oct. '08.	304	9,109	3.66	333.40	388.96	83 34	44 21	39 13
May Queen	A.	6	Mar. '08.	321	8,527	3.74	319.31	372.53	79 81	41 91	37 90
L. Nancie 2nd	A.	7	Mar. '08.	277	8,326	3.8	317.63	370.57	79 41	38 23	41 18
B. Buttercup	J.	10	Sept. '07.	366	6,156	5.07	312.32	364.67	78 08	37 20	40 88
S. Ramona	J.	6	Oct. '07.	366	7,044	4.33	305.34	356.23	76 33	37 52	38 81
Lady R., O.A.C.	H.	5	July, '07.	366	8,326	3.66	305.14	355.99	76 27	44 69	31 58
Adelaide.	H.	8	July, '08.	274	8,199	3.5	287.51	335.43	71 86	43 62	28 24
Molly N., O.A.C.	H.	3	Aug. '08.	341	8,368	3.43	286.94	334.76	71 73	44 13	27 60
Tibby F.	A.	2	Sept. '08.	340	7,111	4.0	283.79	331.08	70 93	39 75	31 18
Buttercup's Q.	J.	9	Dec. '07.	355	5,379	5.2	282.00	329.00	70 47	37 95	32 52
Toitilla	H.	6	Nov. '08.	251	8,283	3.38	279.83	326.47	69 95	46 76	23 19
Inka M.	H.	8	May, '08.	244	8,408	3.3	278.21	324.58	69 54	35 18	34 36
Dewdrop's A	J.	6	June, '08.	360	5,183	5.1	263.76	307.72	65 93	37 62	28 31
Beauty, O.A.C.	H.	3	Jan. '08.	279	8,385	3.02	253.11	295.29	63 25	42 61	20 64
Denty 10th.	A.	9	Aug. '08.	265	5,072	4.9	249.01	290.51	62 24	34 60	27 64
White Rose.	A.	4	Aug. '08.	316	6,028	4.1	248.27	289.65	62 05	39 04	23 01
Mercena N.	H.	3	Nov. '08.	298	6,972	2.98	207.57	242.16	51 89	40 91	10 98
Dainty 3rd.	A.	8	Aug. '08.	239	5,408	3.54	191.39	223.28	47 82	35 02	12 80
Abby M. N.	H.	2	May, '08.	193	6,053	3.01	182.54	212.96	45 64	17 87	27 77
Dreamy	J.	3	Oct. '08.	302	3,658	5.0	182.46	212.87	45 60	31 33	14 27
Margaret C	H.	2	June, '08.	168	4,187	3.09	129.40	150.96	32 34	15 43	16 91
Average of 26 cows.				299.8	7,725	3.7	285.61	335.21	71 40	39 57	31 83

Notes on Dairy Herd Record.

1. In the column denoting breed, "A" stands for Ayrshire, "H" for Holstein, and "J" for Jersey.

2. The cows are ranked in order of production of butter fat.

3. An accurate record of food consumed has not been kept, but occasional weighings have enabled us to make a reasonably close estimate.

4. Foods are valued as follows: Meal and bran, $20.00; oil cake, $32.00; hay, $8.00; roots, $2.00; and silage, $2.00 per ton. Pasture is charged at $1.00 per month per cow. In some cases, these values are below market prices, but we have retained the method employed last year so that results of the two years may be comparable.

5. In the case of heifers with their first calf, food has been charged only since calving.

6. "Denty 10th," "Dainty 3rd." and "White Rose" are recently imported Ayrshire cows. They had previously calved in the spring, and were purposely held over for later calving. Thus their records include a long period of "stripping," which fact, coupled with the radical change in conditions, has materially interfered with their showing. These cows should give a good account of themselves another year. Denty's recent performance is referred to in another place.

7. "Boutsje," the famous Holstein cow of last year, has done well, but nothing like last year's performance. This is due to the fact that she met with an unfortunate accident during the summer.

8. "Abby M. N.," (Abby Mercena Netherland) dropped her first calf in May. Though she is third from the bottom of the list, she has made a remarkably good showing under the circumstances, and is a heifer we value very highly. Her average milk production per day since calving is 31.3 pounds.

9. The herd record includes every female giving milk in the herd, except one cow, which we very recently purchased.

A good Ayrshire Cow. Denty 10th of Auchenbrain (imp.) —24,739—. Owned by Ontario Agricultural College. Record: September, 1,301 lbs. milk, testing 5.6 per cent. fat; October, 1,200 lbs. milk, testing 5.3 per cent. fat; November, 977 lbs. milk, testing 5.2 per cent. fat. Total for 3 months: Milk, 3,478 lbs.; fat, 187.2 lbs.; butter (obtained by adding $\frac{1}{6}$ to fat), 218.2 lbs. This is the first time Denty has "freshened" since she was imported.

Experiments with Dairy Cows.

During the winter of 1907-08, Mr. P. H. Moore, a senior student, wished to conduct some experimental work in feeding dairy cows as a basis for his thesis. We, therefore, allowed him to conduct certain experiments under our supervision, so that we regard the results as belonging to our department.

The principal work consisted of comparing two dairy foods manufactured by the Quaker Oats Company, of Peterboro, with bran and oats. The two foods in question are known as Molac Dairy Food and Schumacher.

Three experiments were conducted. One with oats and bran against oats and Molac, one with bran and oats against bran and Schumacher, and one with bran and oats against Molac and Schumacher. The third experiment was intended as a sort of check experiment, and it brings out a very peculiar feature which is worthy of special notice, and renders it necessary to take all three experiments into consideration before drawing any conclusions.

Each experiment is divided into three periods. During the first period the cows were fed bran and oats, during the second period they were fed the food desired to compare with bran and oats, and during the third period they were fed bran and oats again. In making comparisons, the average of the first and third periods is compared with the middle period.

The results given in the tables do not include the first week after each change in food, one week being allowed to elapse to enable the cows to become accustomed to the change in food.

In addition to the concentrates, the cows were fed cut hay, silage, and mangels, the bulky part of the ration being the same for each cow throughout the experiment.

It will be noted that in the first experiment the rations are identical, except that Molac was substituted for bran in the middle period. This admits of a comparison of Molac and bran when fed in conjunction with oats.

In the second experiment, the rations are identical, except that Schumacher was substituted for oats during the middle period, so that we have a comparison of Schumacher with oats when fed in conjunction with bran.

The amount of Molac fed in the first experiment was less than the amount of bran, and the Schumacher fed in the second experiment was less than the amount of oats. It might have been more satisfactory had the amounts been equal in each case, but the reduction was made because it is claimed that Molac contains more nutriment than bran, and that Schumacher contains more nutriment than oats, and an attempt was made to equalize the rations.

Three cows were used in each of the first two experiments, and six cows in the third. The following tables show results:

Molac Dairy Food *vs.* Bran.

Table Showing Milk and Fat Produced and Concentrates Consumed by Three Cows.

——	Period I. Two weeks, Oats and Bran.	Period III., Two weeks, Oats and Bran.	Average of Periods I. & III. Two weeks Oats and Bran.	Period II., Two weeks, Oats and Molac Dairy Food.
Total milk produced by 3 cows...	1,137 lbs.	1,024 lbs.	1,085.5 lbs.	1,074 lbs.
Average milk, per cow, per day..	27.07 lbs.	24.38 lbs.	25.71 lbs.	25.57 lbs.
Average per cent. of fat.....	3.79	3.9	3.85	3.76
Total fat produced by 3 cows	43.167 lbs.	40.02 lbs.	41.5935 lbs.	40.416 lbs.
Average fat, per cow, per day....	1.028 lbs.	.953 lbs.	.99 lb.	.962 lb.
Concentrates consumed by 3 cows	Oats, 168 lbs. Bran, 210 lbs.	Oats, 168 lbs. Bran, 210 lbs.	Oats, 168 lbs. Bran, 210 lbs.	Oats, 168 lbs. Molac, 168 lbs.
Bran or Molac consumed per 100 lbs. fat produced.	.....	.....	Bran, 504.88 lbs.	Molac, 415.67 lbs.
Relative value of Bran and Molac for producing butter fat.....	.....	.....	Bran, 100.	Molac, 121.4

Schumacher *vs.* Oats.

Table Showing Milk and Fat Produced and Concentrates Consumed by Three Cows.

——	Period I., Two weeks, Bran and Oats.	Period III., Two weeks, Bran and Oats.	Average of Periods I. and III. Two weeks, Bran and Oats.	Period II. Two weeks, Bran and Schumacher.
Total milk produced by 3 cows ..	1,563 lbs.	1,415 lbs.	1,489 lbs.	1,404 lbs.
Average milk per cow per day ...	37.21 lbs.	33.69 lbs.	35.45 lbs.	33.43 lbs.
Average per cent. of fat	3.56	3.81	3.68	3.45
Total fat produced by 3 cows	55.642 lbs.	33.960 lbs.	64.801 lbs.	48.375 lbs.
Average fat, per cow, per day....	1.325 lbs.	1.285 lbs.	1.305 lb.	1.152 lb.
Concentrates consumed by 3 cows	Bran, 224 lbs. Oats, 182 lbs.	Bran, 224 lbs. Oats, 182 lbs.	Bran, 224 lbs. Oats. 182 lbs.	Bran, 224 lbs. Schumacher, 140 lbs.
Oats or Schumacher consumed per 100 lbs fat produced.	.....	.....	332.1 lbs.	289.4 lbs.
Relative value of Oats and Schumacher for producing butter fat	.....	.....	Oats, 100.	Schumacher, 114.7

Molac and Schumacher *vs.* Oats and Bran.

Table Showing Milk and Fat Produced and Concentrates Consumed by Six Cows.

——	Period I., One week, Bran and Oats.	Period III., One week, Bran and Oats.	Average of Periods I. and III. One week, Bran and Oats.	Period II., One week, Molac and Schumacher.
Total milk produced by 6 cows...	1,204 lbs.	1,050 lbs.	1,127 lbs.	1,173 lbs.
Average milk, per cow, per day ..	28.66 lbs.	25. lbs.	26.83 lbs.	27.93 lbs.
Average per cent. of fat	3.92	4.04	3.98	3.74
Total fat produced by 6 cows.....	47.27 lbs.	42.524 lbs.	44.892 lbs.	43.962 lbs.
Average fat, per cow, per day....	1.125 lb.	1.012 lb.	1.068 lb.	1.047 lb.
Concentrates consumed by 6 cows	Bran, 217 lbs. Oats, 175 lbs.	Bran, 217 lbs. Oats, 175 lbs.	Bran, 217 lbs. Oats, 175 lbs	Molac, 217 lbs. Schumacher, 175 lbs.
Concentrates consumed per 100 lbs. fat produced.	.....	.....	Bran and Oats, 891.6 lbs.	Molac and Schumacher, 873.1 lbs.
Relative value of Oats and Bran *vs.* Molac and Schumacher for producing butter fat.	.....	.....	Bran and Oats, 100	Molac and Schumacher, 102.1

Discussion of Results.

1. In the comparison of molac and bran, there was a slight falling off in milk yield and per cent. of fat during the time molac was fed. This would indicate that the ration was scarcely equal to the oats and bran, and that feeding less molac than bran was scarcely warranted.

2. The falling off in production was only slight, and when we take the molac consumed per 100 pounds, butter fat produced, molac shows a decided advantage over bran.

3. The falling off in milk and per cent. of fat was quite marked when Schumacher was substituted for oats, and it looks as if more Schumacher should have been fed.

4. The amount of Schumacher consumed per 100 pounds fat produced, was less than the amount of oats, which would make it appear that Schumacher was superior to oats.

5. In the third experiment, equal quantities of molac and bran, and equal quantities of Schumacher and oats were used, and here it will be seen that the yield of milk increased during the time the cows were on Molac and Schumacher, but the per cent. of fat slightly decreased.

6. The increase in production where Molac and Schumacher were fed against equal quantities of oats and bran, is not what one would expect from the results of the two previous experiments, but this point is seen more clearly when we take relative values, as follow in the next section.

7. In the comparison of Molac and bran, we found that if we represented the feeding value of bran as a producer of butter fat as 100, the value of Molac would be 121.4 or 21.4 per cent. higher feeding value than bran.

Peace and plenty.

By the same method of comparison, Schumacher showed 14.7 per cent. higher feeding value than oats. But Molac and Schumacher combined showed only 2.1 per cent. higher feeding value than oats and bran combined.

8. It would look, therefore, that if as much Molac had been fed as was fed of bran in the comparison of these two foods, the Molac would not have made such a favourable showing as compared with bran in the production of butter fat. It is quite probable that the effects of the liberal feeding of the first period was carried over into the second period, and that Molac reaped the advantage of it Had the milk flow been maintained during the time Molac was fed, there would be no ground for this claim.

9. The same conclusion may be drawn regarding Schumacher as compared with oats.

10. There seems to be no doubt that the values of Molac as compared with bran, and Schumacher as compared with oats as shown in the first two experiments, are rather high.

11. It would further appear that both Schumacher and Molac give better results when fed as only part of the concentrates, than when they comprise the total concentrates of a ration.

12. Both these feeds seem to be valuable dairy foods, but their uniformity of composition within reasonable limits should be guaranteed.

FATTENING STEERS FOR EXPORT.

Short Keep vs. Long Keep Steers.

As stated in previous reports, we define short keep steers as heavy, fleshy steers which can be finished for export by stall feeding for two or three months. Long keep steers are lighter and thinner than the short keep, and may require five or six months' stall feeding to fit them for market. This year's experiment is a continuation of the work conducted during the two previous years, and makes the third experiment of the series.

Porterhouse, sirloin, and rib cuts from cross-bred Angus-Shorthorn steer, bred and fed by Ontario Agricultural College. Age when slaughtered, 2 years 27 days. Live weight, 1,650 lbs. Dressed weight, 1,121 lbs. Per cent. dressed carcase, 67.9 per cent.

Plan of Experiment. Eight steers were used in each group, but one of the long keep steers proved to be a very unsatisfactory feeder and was dropped from the experiment soon after its commencement, leaving seven steers in the long keep group. The steers were all tied in stalls, and their ration consisted of meal, hay, straw, roots, and silage. The meal ration during most of the time consisted of ground barley and bran in the proportion of about three parts barley to one of bran. During part of the time, a small proportion of frozen wheat was substituted for part of the barley.

The short keep steers were started on between four and five pounds of meal each per day, and this quantity was increased as rapidly as we deemed

safe, their maximum meal ration being between eight and nine pounds each per day. On an average, they received .559 pound (a little over ½ lb.) of meal per day per one hundred pounds of their average live weight. They were fed for seventy-seven days.

The long keep steers were started on about half the quantity of meal fed to the short keep steers, and increased more gradually. They were fed for one hundred and sixty-eight days, and averaged .56 lb. (practically the same as the short keep) of meal per day per one hundred pounds of their average live weight.

The following table gives some details of weights and gains:

Table Showing Weights, Gains, and Food Consumed by Short Keep and Long Keep Steers.

	Group I. 8 steers. Short keep.	Group II. 7 steers. Long keep.
Average weight of steers at commencement of experiment	1,231.2 lbs.	1,085 lbs.
Average weight of steers at close of experiment	1,404.4 lbs.	1,421.4 lbs.
Number of days on experiment	77 days.	168 days.
Average gain per steer	173.2 lbs.	336.4 lbs.
Average daily gain per steer	2.25 lbs.	2 lbs.
Food consumed	Meal, 4,533 lbs. Hay, 5,325 " Straw, 1,025 " Roots, 12,820 " Silage, 12,820 "	Meal, 8,250 lbs. Hay, 5,260 " Straw, 6,937 " Roots. 25,659 " Silage, 25,659 "
Average meal consumed per day per 100 lbs. average live weight of steers	.559 lb.	.56 lb.

The table which appears above gives a clear idea of the food consumed by the steers and what they did with it, but the most difficult point has not been touched, namely, the returns made in dollars and cents by the two groups. Money returns are influenced more by market conditions than by the use the steers make of their food. For this reason, we have attempted to show value received for foods consumed by the steers in three years' experiments, under different prices paid and received for the steers. It is impossible, of course, to treat of all the varying market prices of steers, and we must therefore be content with a few typical cases.

An unsatisfactory feature of steer feeding is the fact that if a steer is driven from the pasture field to the scales, and immediately afterwards tied in the stable, it will almost invariably be found that after a few days in the stable he will weigh less than he did when he came off the pasture. We have sometimes found this difference to amount to fifty or sixty pounds per head, and as our calculations are based upon stable weights, we have not thought it worth while to consider a lower cost than 4 cents per pound for long keep steers. For the same reason, we have made the maximum cost of short keep steers a little high, namely 5 cents per pound. As to the selling price we have made it range from 5 cents to 5½ cents per pound. It is true that export steers have quite frequently sold at over 5½ cents per pound during recent years, but a maximum of 5½ cents is conservative, and will answer for purposes of comparison.

The following table shows results of three years' work:

TABLE SHOWING PRICES RECEIVED PER TON FOR MEAL UNDER DIFFERENT MARKET PRICES FOR STEERS, ALLOWING $12.00 PER TON FOR HAY; $6.00 FOR STRAW; $2.00 FOR SILAGE; AND 10c PER BUSHEL FOR ROOTS. THE TABLE SHOWS RESULTS OF EACH OF THREE YEARS, AND AVERAGE OF THREE YEARS.

	1906.		1907.		1908.		Average of three years.	
	Short keep.	Long keep.	Short keep.	Long keep.	Short keep.	Long keep.	Short keep.	Long keep.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
If bought at 5c. and sold at 5½c. per lb...	27 39	3 29	26 04	14 41	24 80	10 80	26 08	9 50
If bought at 4¾c. and sold at 5½c. per lb...	41 77	9 25	36 85	21 25	35 66	15 40	38 09	15 30
If bought at 4½c. and sold at 5½c. per lb...	55 99	15 22	47 66	28 09	46 53	20 00	50 06	21 10
If bought at 4¼c. and sold at 5½c. per lb...	70 20	21 18	58 47	34 93	57 39	24 60	62 02	26 90
If bought at 4c. and sold at 5½c. per lb...	84 42	27 15	69 28	41 77	68 25	29 20	73 98	32 71
If bought at 4c. and sold at 5¼c. per lb...	69 20	19 78	57 20	33 49	55 86	23 23	60 75	25 50
If bought at 4c. and sold at 5c. per lb....	53 97	12 41	45 12	25 20	43 47	17 26	47 52	18 29

In making our calculations, we have made certain fixed charges for the bulky fodders. In each calculation hay is charged at $12.00 per ton; straw, $6.00 per ton; roots, 10 cents per bushel; and silage, $2.00 per ton. The total value of the bulky fodders at the prices quoted has been deducted, in each case, from the difference between the total cost and total selling price of the steers, and whatever is left is what was received for the meal consumed by the steers. It will be noted that in some cases very high returns are given for meal consumed, but these are cases where there is a wide spread between the buying and selling price per pound of short keep steers. As it is practically impossible to obtain a wide spread in prices for short keep steers, it would not be worth while including these figures were it not for the purpose of bringing out more clearly the difference between short keep and long keep steers. So long as the reader keeps this fact in mind, the figures will not be misleading.

NOTES ON RESULTS.

1. No charge is made for labor, and no credit given for manure.

2. It will be noted that when bought at 5 cents per lb. and sold at 5½ cents per lb., the short keep steers gave an average return of $26.08 per ton for meal consumed, which may be regarded as a very satisfactory showing for such a narrow spread between the buying and selling price.

3. The long keep steers, when bought at 4¼ cents per lb. and sold at 5½ cents per lb. gave an average value of $26.90 per ton for meal consumed. Thus, a spread of 1¼ cents per lb. in the case of the long keep steers gave very little better returns than a spread of ½ cent per lb. in the case of the short keep steers.

4. It is useless to expect a wide spread between the buying and selling prices of short keep steers, but the high value which short keep steers would return for meal consumed, under a wide spread, brings out a strong contrast between the two classes of steers. Furthermore, the returns made by the long keep steers show very clearly the absolute necessity for a wide spread in prices in the case of long keep steers, because, even under the maximum spread of 1½ cents per lb., the long keep steers did not return particularly high prices for food consumed.

5. So far as these results go, they indicate that steers which can be finished with about two months of feeding, may give fairly satisfactory returns with a spread of ½ cent per lb. between the buying and selling prices; but with steers which have to be fed five or six months, the feeder is hardly safe with a spread of less than 1¼ cents per pound.

6. The marked advantage of the short keep over the long keep steers is due to two things: (1) The greater original weight of the short keep steer, upon which the owner gets the advantage of the spread between the buying and selling price per pound; (2) The smaller amount of expensive meat which it is necessary for the owner to put upon the short keep steer to make him fit for the market.

Feeding Steers Loose vs. Tied.

In this experiment, the eight short keep steers used in the experiment with short keep *vs.* long keep steers, were compared with four short keep steers fed in a loose box. Owing to lack of accommodation, we were unable to have as many loose steers as we had of tied steers.

The method of feeding the tied short keep steers has already been described, and the loose steers were fed practically the same, except that they had better appetites than the tied steers, and we aimed to supply them accordingly.

This is the third experiment of the kind.

The table which follows gives some details regarding the steers:

Table Showing Weights, Gains, and Food Consumed by Tied and Loose Steers.

	Group I. 8 steers. Tied.	Group II. 4 steers. Loose.
Average weight of steers at commencement of experiment	1,231.2 lbs.	1,141.25 lbs.
Average weight of steers at close of experiment	1,404.4 lbs.	1,353.75 lbs.
Number of days on experiment	77 days.	77 days.
Average gain per steer	173.2 lbs.	212.5 lbs.
Average daily gain per steer	2.25 lbs.	2.78 lbs.
Food consumed	Meal, 4,533 lbs. Hay, 5,325 " Straw, 1,025 " Roots, 12,820 " Silage, 12,820 "	Meal, 2,399 lbs. Hay, 2,692 " Straw, 600 " Roots, 6,704 " Silage, 6,704 "
Average meal consumed per day per 100 lbs. average live weight of steers	.559 lbs.	.624 lbs.

It is worthy of note that the loose steers in each of the three experiments ate more than the tied steers, and made larger gains. If values are attached to all the foods they consumed, they show a lower cost per pound of increase than the tied steers in each experiment.

In the table which follows, the two groups have been compared upon the basis of value returned for food consumed, the same as was done in the case of the short and long keep groups, but we have taken fewer variations in price. These are both short keep groups, and there would be nothing gained by including such wide spreads in prices as was necessary when dealing with long keep steeers.

TABLE SHOWING VALUE RETURNED PER TON FOR MEAL CONSUMED BY TIED AND LOOSE STEERS, ASSUMING THAT HAY IS WORTH $12.00, STRAW $6.00, AND SILAGE $2.00 PER TON, AND ROOTS 10c PER BUSHEL, THE TABLE SHOWS RESULTS FOR THREE YEARS, AND AVERAGE OF THREE YEARS.

	1906.		1907.		1908.		Average of three years.	
	Tied.	Loose.	Tied.	Loose.	Tied.	Loose.	Tied.	Loose.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
If bought at 5c. and sold at 5½c. per lb...	27 39	34 49	26 04	26 19	24 80	28 13	26 08	29 60
If bought at 4¾c. and sold at 5½c. per lb...	41 77	48 12	36 85	36 18	35 66	37 65	38 09	40 65
If bought at 4½c. and sold at 5½c. per lb...	55 99	61 75	47 66	46 17	46 53	47 17	50 06	51 70

NOTES ON TABLE.

1. It will be noted that the loose steers have a decided advantage over the tied steers in returns for food consumed, in the average of three experiments.

2. The loose steers were handicapped in these experiments by being lighter than the tied steers. It is due solely to this fact that the tied steers show a slight advantage over the loose steers in 1907. Had the two groups been equal in average weight, the loose steers would have made the better showing. In 1906 and 1908, the loose steers were able to overcome their handicap of lighter weight.

3. Our experience leads us to believe that it is more profitable to feed steers loose than to tie them in stalls.

4. Loose steers are less easily surfeited, are less likely to become crippled or sore in their feet, and appear to shrink less when driven to market.

EXPERIMENTS WITH SWINE.

Comparison of Various Dairy By-Products as Foods for Swine.

Owing to the interest which the manufacture of whey butter has aroused of late, we thought it advisable to compare separated whey with ordinary whey as a food for swine. In addition to comparing these two foods, we also compared skim milk and buttermilk with whey.

Plan of Experiment. Originally, 60 pigs were divided into five groups of twelve pigs each, but it was thought advisable to discard certain pigs as unfit for experimental work, and the experiment was completed with the number of pigs in each group indicated in the table which follows:—

Group I. was fed skim milk and meal; Group II., buttermilk and meal; Group III, ordinary whey and meal; Group IV., separated whey and meal; and Group V. was a check group fed water and meal.

The grain ration consisted of barley and frozen wheat, to which wheat middlings were added in the following proportions by weight; 1st, 30 days, 3 parts middlings to 1 part ground grain; 2nd, 30 days, 2 parts middlings to 1 part ground grain; 3rd, 30 days, 1 part middlings to 1 part ground grain; 4th, 30 days, 1 part middlings to 2 parts ground grain.

Nearly two and a half pounds of milk and buttermilk were fed with each pound of meal, and about two and three-quarter pounds of whey with each pound of meal.

Table Showing Weights, Gains, and Food Consumed.

	Group I. 11 pigs. Skim-milk and meal.	Group II. 12 pigs. Butter-milk and meal.	Group III. 11 pigs. Ordinary whey and meal.	Group IV. 10 pigs. Separated whey and meal.	Group V. 12 pigs. Water and meal.
Duration of experiment.....	120 days.	120 days.	120 days.	120 days.	120 days.
Weight of pigs at commencement of experiment	485 lbs.	573 lbs.	450 lbs.	427 lbs.	541 lbs.
Weight of pigs at close of experiment	2,278 lbs.	2,480 lbs.	1,987 lbs.	1,713 lbs.	1,548 lbs.
Total gain in weight.....	1,793 lbs.	1,907 lbs.	1,537 lbs.	1,286 lbs.	1,007 lbs.
Average daily gain per pig..	1.36 lb.	1.32 lb.	1.16 lb.	1.07 lb.	0.7 lb.
Total food consumed	Meal, 4,553 lbs. Skim-milk, 11,223 lbs.	Meal, 4,888 lbs. Butter-milk. 12,042 lbs.	Meal, 4,142 lbs. Whey, 11,486 lbs.	Meal, 3,821 lbs. Whey, 9,959 lbs.	Meal, 4,331 lbs.
Food consumed per 100 lbs. increase in weight.....	Meal, 254 lbs. Skim-milk, 626 lbs.	Meal, 256 lbs. Butter-milk. 631 lbs.	Meal, 269 lbs. Whey, 747 lbs.	Meal, 297 lbs. S. whey, 774 lbs.	Meal, 430 lbs.

Points of Interest.

1. Skim milk gave the largest gain per pig, as well as the most economical gain.

2. Buttermilk came so close to skim milk in feeding value, that it may be regarded as practically equal to skim milk, so far as this experiment goes.

3. Ordinary whey shows a distinct advantage over separated whey in this experiment.

4. If we compare each group with our check group, we find that if we represent the feeding value of separated whey by 100, the feeding value of ordinary whey would be approximately 125, buttermilk 160, and skim milk 163.5. That is to say, ordinary whey showed a feeding value 25 per cent. higher than that of separated whey in this experiment, buttermilk 60 per cent. higher, and skim milk 63½ per cent. higher.

5. The feeding value of each kind of whey compared with skim milk is much higher in this experiment than in any other we have conducted, and we feel sure that it is a great deal higher than may ordinarily be expected. It will be noticed that we fed a comparatively small proportion of whey to meal, and under such conditions, whey will always show a much higher feeding value per 100 pounds than when fed in larger quantities. The same is true of skim milk and buttermilk, but perhaps not quite to the same extent. There is little doubt, however, that the use of small proportions of these dairy by-products has tended to bring them more closely together in feeding value. As ordinarily fed whey seldom shows a value higher than one-half that of skim milk or buttermilk.

Barley vs. Frozen Wheat.

Frozen wheat is a product which varies extremely in quality, and, therefore, is an unsatisfactory food with which to experiment. The frozen wheat used in this experiment tested only 43½ pounds to the bushel, so that it was not a high class sample by any means.

Wheat middlings were fed with the wheat and barley. During the first 30 days, the middlings constituted seventy-five per cent. of the meal ration; during the second 30 days, sixty-six per cent.; during the third 30 days, fifty per cent.; and during the last 30 days, thirty-three per cent.

Three groups of pigs were used. Group I, was fed barley and middlings; Group II, frozen wheat and middlings; and Group III, a mixture of equal parts barley and frozen wheat, to which was added the same proportion of midlings as was used in the other two groups.

Some dairy by-products were used, but in the table which follows, the dairy by-products are reduced to their meal equivalent, according to the relative values obtained for these foods in the experiment previously described. All groups fared equally in regard to dairy by-products.

Table Showing Weights, Gains, and Food Consumed.

	Group I. 18 Pigs. Barley and Middlings.	Group II. 20 Pigs. Frozen Wheat and Middlings.	Group III. 18 Pigs. Barley, Frozen Wheat and Middlings.
Duration of experiment	120 days.	120 days.	120 days.
Total weight of hogs at beginning of experiment	740 lbs.	754 lbs.	982 lbs.
Total weight of hogs at close of experiment	3,064 lbs.	3,407 lbs.	3,535 lbs.
Total increase in weight	2,324 lbs.	2,653 lbs.	2,553 lbs.
Daily increase per pig	1.08 lb.	1.1 lb.	1.18 lb.
Total meal or its equivalent consumed	10,015 lbs.	11,325 lbs.	11,052 lbs.
Meal, or its equivalent, consumed per 100 lbs. increase in weight.	430.9 lbs.	431.4 lbs.	432.9 lbs.

Notes on Results.

1. It will be noted that the results from the frozen wheat and barley are extremely close, both in rate of gain and in food consumed per 100 pounds gain.

2. The difference between the food required for 100 pounds gain with barley as compared with frozen wheat is so slight that it may be disregarded. A wider difference might easily be obtained where the same food was employed in each group.

3. Group III, which was fed the mixture, made slightly larger but more expensive gains than the other two groups. Here, again, the difference is so slight that it cannot, with certainity, be assumed that it was caused by any difference in the foods.

4. In this experiment, therefore, the frozen wheat which was employed, proved practically equal to a good quality of barley in the results obtained.

In concluding my report, I wish to bear testimony to the excellent work of my assistant, Mr. R. W. Wade, and to state that this report may be considered as practically a joint report of Mr. Wade and myself.

Respectfully submitted,

G. E. DAY.

PART XII.

THE LECTURER IN HORTICULTURE.

To the President of the Ontario Agricultural College:

SIR,—I beg to present herewith the annual report of the Lecturer in Horticulture.

The first annual Short Course in Horticulture was held from January 27th to February 8th, 1908. The total attendance, exclusive of students and others connected with the College, was seventy-eight, which was felt to be very gratifying. The thanks of this department are due those who so ably assisted.

Addresses on various topics connected with fruit growing were delivered at the following places in connection with special Fruit Institutes: Grimsby, Trenton, Leamington, Jordan, Thornbury, Meaford, Simcoe, Dunnville, Oshawa, Owen Sound, Iroquois and Picton. This phase of the work brings one into close contact with growers in all parts of the country and would seem to be particularly desirable for all concerned.

I also enjoyed a few days in attendance at the Graduate School of Agriculture held at Cornell University in the same month. One comes in contact at such places with the leaders in one's own kind of work, and great benefit is thereby gained.

The lecture work in this department has been extended during the year by the addition of pratical work in fruit growing for the Freshman class in the spring term, and also by the addition of practical work with fruit and vegetables during the fall term of the Second year. Owing to the large size of the classes, considerable repetition is necessary, and this, of course, means much additional work. Slight changes have been made in the other courses, but in general this work has proceeded on much the same lines as in former years.

New equipment has been added in the shape of a fruit and vegetable storage house, which was sorely needed. This building is thirty-three by forty-three feet, with a basement for vegetables and first floor for fruit storage. A double cottage to be occupied by Mr. McMeans and Mr. Hunt has also been provided. These two buildings cost $3,000 each.

A new and fairly complete line of modern orchard implements has been added this fall. These will be tested so that desirable and little known tools may be brought to the notice of growers generally.

In co-operation with the Department of Entomology, three hives of bees were purchased in the spring and located in the College orchard. These were managed for increase and not for honey, and we now have five swarms going into winter quarters in good condition. They are being wintered out-of-doors because of the lack of a suitable cellar for the purpose.

ORCHARD NOTES.

Trees and plants survived last winter in excellent condition. Little harm was done to raspberry canes or other tender wood, and fruit buds as tender as those of Burbank plum were almost entirely uninjured. This variety bore well, which is somewhat unusual in this locality, as the buds are usually destroyed by alternate freezing and thawing in late winter.

The blooming period of trees was accompanied by ideal warm sunny weather with occasional showers. This was followed by wet, muggy weather, quite favorable to the development of apple and pear scab, and as a consequence those trees unsprayed or poorly sprayed developed considerable quantities of this disease.

The autumn was particularly dry and tree growth matured well in consequence.

Wheat was sown as a cover crop in the college orchard on August 1st. This would be too late to cause thorough ripening of the wood in an average season in this locality, but on account of the unusual lack of rain this fall no harm was done by the delay of seeding.

Good crops were harvested of strawberries, currants, gooseberries, American plums, summer and fall apples, and fair crops of raspberries, cherries, and pears. Most plums other than Americanas were a light crop, as were also winter apples.

About five hundred plants each of several varieties of strawberries were set out in early spring. They have been restricted to hills, and will form the subject of careful studies in connection with the proper methods of improvement to be followed with this fruit and with others of like nature.

Seedling strawberries and raspberries are also under observation, but so far no varieties worthy of introduction have been secured.

Fertilization of Blossoms.

The following varieties of apples are again recorded as having proven self-fertile:—Duchess, Snow, Ribston, McMahon White, Ontario, Rhode Island Greening.

The following varieties are recorded this year for the first time as having proven self-fertile. Some were tested this season for the first time while others have been tested previously:—Baxter, Gideon, Winter St. Lawrence, Magog, Longfield, Shackleford, Fanny, Bottle Greening, Bismark, Fall Jennetting, Garden Gem, and Transcendant and General Grant crabs.

A large number of blossoms of Northern Spy were carefully emasculated and pollenized by hand with pollen of Spy procured from Trenton, Oshawa, Thornbury, and Jordan. One small fruit formed under pollen from the last named place. This is the first time, so far as the writer is aware, that this variety has ever set fruit by its own pollen, and even in this case the lone specimen borne could hardly be taken to indicate any appreciable degree of self-fertility.

Spraying.

Tests were made of the following strengths of lime-sulphur applied for the oyster-shell scale on the dormant wood in early spring:—

(1)	Lime	20	lbs.	Sulphur	15	lbs.	Water	400	lbs.	(40	gallons).
(2)	"	20	"	"	18	"	"	"	"	"	"
(3)	"	20	"	"	20	"	"	"	"	"	"
(4)	"	22	"	"	18	"	"	"	"	"	"

Numbers 2, 3, and 4 proved perfectly satisfactory, and with any one of these formulas the question of controlling the scale is simply one of thorough spraying. Number 1 was scarcely effective enough to be recommended. These experiments demonstrated that the scale can be practically exterminated, even on badly infested trees, by one application if the mixture is properly prepared and *thoroughly* applied. It is advisable to scrape off all rough bark with a dull hoe before spraying for any scale insect.

The mixture was prepared by boiling with steam from a small feed-cooker. It boiled invariably at 208 degrees to 210 degrees F., which approximates normal boiling point of water at this altitude. Boiling for longer periods than one hour failed to render the preparation any more effective.

"Niagara" Brand Lime-Sulphur, a commercial preparation, was applied under the same conditions as above mentioned to trees seriously infested with oyster shell scale, and proved to be fully as satisfactory as any mixture used. It is ready for application simply upon dilution with the requisite quantity of water and on that account is very convenient, especially for the amateur. The proportion used was one part to eight parts of water, whereas the manufacturers recommend it to be used one to eleven. This was done in the absence of the manufacturer's directions and at the suggestion of the Department of Chemistry, after analysis and comparison with the standard home-made material.

This same material was applied as a summer spray on June 5th, at which time the young of the scale were running on the tree. The strength used was one to twenty, and also gave excellent results.

The V I and V II spray mixtures were applied as directed and under most favourable weather conditions to one row of apple trees. Satisfactory results were not secured. In justice to the manufacturers, it should be stated that after the spraying was done, word was received that the V II used had been found by the company's chemist to be incorrectly compounded, or had in some unexplained manner become deteriorated. A second sample of V II was received from the agent later in the season, but too late to be given a fair trial on oyster-shell scale. For an account of a test of this second sample on wooly aphis, see the report on Vegetables.

The general spraying of the college orchard consisted this year in the application of:

(1) Home-made Lime-sulphur at the time buds were swelling but before growth started, with formulæ given above.

(2) Bordeaux Mixture immediately preceding the opening of the blossoms.

(3) Bordeaux immediately after the fall of the bloom.

In the second and third sprayings, an arsenical poison was used, Paris Green being applied to one-half of the orchard and Arsenate of Lead to the other. The quantities used were six ounces Paris Green in one case and two pounds Arsenate of Lead in the other, per forty gallons of water. No appreciable difference in the effectiveness was noted, but it was thought that the slightly higher cost of arsenate of lead was more than compensated by its greater uniformity of application, as well as by its power of adhering longer to the foliage.

The apple scab was almost entirely controlled and some really excellent results were secured on heavily loaded trees of such susceptible varieties as Snow and St. Lawrence.

The number of sprayings given was not sufficient to control the scab on Flemish Beauty pear in those cases where the trees occupied a low situation lacking in atmospheric drainage. On higher ground good results were obtained with this most susceptible variety.

Owing to the fact that our orchard is composed of very many varieties, of which fifty or more may be in bloom in any one season, we are not able to spray for the codling moth as thoroughly as we would wish. It is impracticable to spray each variety at the proper time because of the wide variation in the dates of blooming of different varieties, and because several varieties are planted in the same row without regard to the matter of con-

venience in spraying. Some kinds begin blooming ten days earlier than others, and the same degree of variation occurs in the dates on which bloom falls. The all-important spraying for the codling moth is said to be that applied *immediately* after blooming. At the time when we make this application we have, consequently, varieties in every stage, from *falling bloom* to *bloom fallen as long as ten days*. The results of our observations under these conditions confirm the statement made above regarding the proper time for combatting the codling moth. We find that trees sprayed *during the falling of the bloom or immediately after* give a lower percentage of injury from codling moth.

This phase of protection from injurious insects has an important bearing on the laying out of orchards. It is, of course, desirable in the first place to limit the number of varieties in a commercial orchard. These varieties should then be arranged in so far as possible with a view to facilitating the spraying of *each variety* at the proper time. This is best done by planting either in solid rows or solid blocks of one variety. The writer prefers solid rows as less delay is occasioned by the time taken in turning with the spraying outfit. On no account should varieties blooming at different dates be planted in the same row, or the ground will require to be covered twice in order to do thorough work.

A leaf-spot disease has frequently seriously defoliated both red and black currants in the college plantation. This year an attempt was made to combat this disease, and Bordeaux Mixture of standard formula was applied to black currants on June 4th, at which time the fruit was comparatively small and quite green. This application was partially successful in checking the progress of the trouble. A further attempt was made with red currants, spraying with Bordeaux immediately after picking. The effect of this spraying was very marked, the plants on the sprayed row retaining their foliage considerably later in the season. It is probable that both these sprayings should be made if complete success is to be obtained against this disease.

Strawberry plants are very commonly attacked by a fungous disease of the foliage called "Strawberry Leaf-Spot." Decidedly beneficial results were secured this season by spraying the young plantations twice with Bordeaux. Some of the best growers spray three and even four times for this trouble.

For further information on spraying and spray materials, see the Reports of the Professors of Chemistry and Entomology.

Orchard Diseases.

Mr. R. M. Winslow, B.S.A., District Representative of the Ontario Department of Agriculture, Picton, Ont., called our attention this season to an apple disease very prevalent in Prince Edward County and elsewhere, and of which a good deal was to be found in the College orchards and vicinity. The disease is a canker affecting apple trees particularly, and information regarding its appearance, methods of treatment, etc., can be secured from Mr. Winslow who has published a special bulletin dealing with the subject.

Notes on Varieties.

Following is a list in order of productiveness of the varieties of strawberries which have given the highest yields here for a period of five years or longer: Buster, Parson's Beauty, Wesley, Warfield, Ruby, Fountain, Hero, Clyde, Barton's Eclipse, Williams, Saunders, Bisel, and Splendid.

Of this list the most desirable market varieties in order of ripening are, Splendid, Warfield, Parson's Beauty, Fountain, and Williams.

We are receiving numerous inquiries regarding the Herbert raspberry. This variety has been tested here for some years and has given uniformly good satisfaction. It is slightly earlier than Cuthbert, larger in size, but probably a little softer berry and the plant is very productive. The quality is hardly as good as Cuthbert.

The report on work conducted with vegetables is presented by Mr. McMeans.

Vegetable Gardening.

Vegetable growing and trucking are becoming of more importance each year. Naturally, vegetable gardening is carried on most extensively in the vicinity of the cities and larger towns, although in many of the rural sections certain truck crops are grown on a large scale and shipped to all parts of the country. As an instance, I may say that this year there were grown in the vicinity of Scotland (Brant County), over one hundred and fifty acres of onions.

Addresses on vegetable topics were delivered at a short-course held at Leamington, also at the annual meeting of the Ontario Vegetable Growers' Association, and some of the growing sections were visited during the season. This work brings one into closer touch with the grower, and seems to bring desirable results.

It was the privilege of the writer to spend some weeks in the onion growing sections of the United States, studying their methods of production and marketing. This work was done for the Provincial Department of Agriculture, on behalf of the Ontario Vegetable Growers' Association.

Variety Tests.

Variety tests were carried on to some extent this year with results as follows:

Beans. The test of garden beans included seventy varieties. Thirty-six of these were what is known as Wax beans and thirty-four were green-podded.

Desirable varieties for home use: For yellow coloured snaps: Grenell's Rustproof Wax, Keeney's Rustless Golden Wax, Burpee's Kidney Wax, German Black Wax, Pencil Pod Black Wax. For green coloured snaps: Red Valentine, Stringless Green Pod, Henderson's Full Measure, and Refugee, For combination of snaps and green-shell in a single variety: Ruby Horticulture Bush, Warren Bush.

Most productive varieties: Yellow coloured snaps: Hodson Wax, Refugee Wax, Keeney's Rustless Golden Wax. Green coloured snaps: Hodson's Green Pod, Refugee, Improved Early, Round Pod, Valentine.

The results of the variety tests with Beets, Carrots, Cabbage, Celery, and Peas, which have been in progress for some years, are not subject to any important change this year. The list of recommended varieties may be found in last year's report.

Onions. Twenty-seven varieties under test. The old standards still prove best, that is, Yellow Globe Danvers, Southport Yellow Globe, and Prizetaker among the yellows; Southport Red Globe and Red Wethersfield among the red varieties. Among the newer varieties on trial this year, the following are promising: Early Rose (Burpee) early, pinkish-rose in colour, flavor mild. New Commercial (Maule) is a prizetaker reduced in size with

keeping quality added. Ebenezer (Johnson), globe-shaped, dark brown in colour, and claimed to be a great keeper.

Tomatoes. Extensive variety tests with tomatoes have been conducted for a number of years. As a rule, only the earliest varieties mature a full crop in our comparatively short and cool summer season at Guelph. This year fifty-four varieties were included in the test. Nine plants of each variety were set four feet apart in a row, with the rows five feet apart to allow for ease of picking. The plants were set in the field on June 8th, the first picking was made on August 6th, and the last picking on September 30th.

The following table gives the results from twenty of the heaviest yielding varieties:

Name of Variety.	Source of Seed.	Germination.	Average weight of fruit per plant.	Average weight of individual fruits.
			ounces.	ounces.
Wealthy	Bolgiano	94	566.1	6.52
Earlibell	Rennie	83	548.5	6.68
Big Victor	Moore & Simon	88	510.1	5.22
Wonderful	" "	80	508.1	6.41
I.X.L.	Bolgiano	92	504.0	6.8
Nolte's Earliest	Gregory	68	493.7	6.5
Mikado	Steele-Briggs	85	485.9	10.36
Jack Rose	Johnson	98	476.0	6.55
Horner's Ex. Early Prolific	Moore & Simon	87	474.0	6.32
Bonny Best	Stokes	100	469.9	6.25
Bond's Minnesota	Gregory	92	465.5	3.89
King of Earliest	Moore & Simons	82	454.3	7.01
Supreme Early	" "	63	451.9	5.45
First of All	Maule	97	447.5	7.47
Hubert's Marvel	Farquhar	72	433.1	4.54
Early Pink	McInnis	82	433.0	7.2
Earliana (Sunnybrook)	Burpee	95	430.8	6.59
Extra Early Red	McInnis	93	424.2	7.27
Sunrise	Gregory	11	418.5	2.72
Express	Sherrington	78	417.2	6.75

The heaviest producing varieties of early tomatoes were as follows: This was the average yield per plant from August 6th to August 20th, inclusive: Horner's Early Prolific, 4 lbs. 11 ozs.; Jack Rose, 4 lbs.; Earliana (Sunnybrook), 3 lbs. 10 ozs.; Early Pink (McInnis) and Earlibell, each 3 lbs. 9 ozs.; Nolte's Earliest, 3 lbs. 5 ozs.; June Pink (Bolgiano), 3 lbs. 4 ozs.; First of All (Maule), and Dominion Day, 2 lbs. 13 ozs.; Extra Early Red (McInnis), 2 lbs. 12 ozs.; Jerrard's New and June Pink (Moore and Simon), 2 lbs. 6 ozs.; Earliest Pink (1115), 2 lbs. 5 ozs.; Express and Bonny Best, 2 lbs. 4 ozs.

The heaviest yielders of late tomatoes were as follows: This was the average production, per plant, from September 19th to September 30th. A picking was made on September 18th, and we base our figures on two pickings made after that date, namely, September 23rd and 30th.

Hubert's Marvel, 19 lbs. 1 oz.; Wonderful, 18 lbs. 5 ozs.; Bond's Minnesota, 17 lbs. 7 ozs.; Acme, 16 lbs. 6 ozs.; Greater Baltimore, 15 lbs. 2 ozs.; Royal Pink and Freedom, 14 lbs. 11 ozs.; Mikado, 14 lbs. 9 ozs.; May's Favorite, 14 lbs. 4 ozs.; Crimson Cushion, 14 lbs. 3 ozs.; Moore's Triumph and Superb Salad, 14 lbs. 2 ozs.; Ponderosa and Stone, 14 lbs.; Big Victor, 13 lbs. 15 ozs.; Beauty, 13 lbs. 11ozs.

Spraying.

A sample of V II was tested on tomatoes and cucumbers in the greenhouse for red spider and woolly aphis, at strengths of 1 to 100 and 1 to 75, with two applications in each case and an interval of three days between applications. There was no noticeable effect.

Potatoes. The potato beetle and potato blight were satisfactorily controlled with four applications of Bordeaux Mixture and Lead Arsenate, the first two sprayings killing all the beetles and the other two being used as a preventive measure for both beetles and blight.

Asparagus Beetle. These insects were very numerous and troublesome the past summer, but were destroyed and subsequently kept under control by spraying with Resin Bordeaux and poison. Ordinary Bordeaux Mixture will not adhere to the asparagus tops, but Resin Bordeaux was not washed off even by continued rains.

This mixture is made as follows: Melt five pounds of resin with one pint of fish oil over a fire. Cool slightly, add one pound of soda lye with stirring; add five gallons of water and boil until the mixture will dissolve in cold water. Use two gallons of this mixture with forty-eight gallons of Bordeaux. Resin Bordeaux was also applied to onions to test its adhesive qualities, as well as its use as a fungicide in preventing mildew. It adhered remarkably well and although the onions went down with mildew, the strip that was sprayed stood up for several days longer than the strip that was not sprayed.

Seed Selection.

Some valuable work in seed growing and seed selection with Beans, Peas, Sweet Corn, and Cabbage was carried on this year, but as yet results are not sufficiently advanced for publication.

Greenhouse Work.

The growing of vegetables under glass is an industry that has been making advanced strides the past few years. In all the cities and large towns of this Province, there is an ever increasing demand for vegetable products grown under glass. At the present time two of the greenhouses are devoted to that phase of the industry.

Water Cress and Parsley. These crops are well worthy of notice to under-glass gardeners. Placed in the cooler part of the house, they gave a continual supply of crisp, tender leaves throughout the whole winter and were in great demand for relishes and garnishing.

Some experiments in stimulating plants with electricity were carried on in the greenhouse last spring by Mr. B. Hoy. That plants respond to electrical stimuli in various ways is well known. The method used consisted in placing copper and zinc plates in the soil, connected overhead by an insulated copper wire. This formed a cell in itself and generated a current. The results of five experiments with radish sown at different dates during the season gave an average increase of nine per cent. in weight of root and 14.4 per cent. in weight of tops. This extra leaf growth on the radish led us to try a small plot with lettuce. It was treated somewhat differently than the radish, in that plants were used, whereas seed was sown in the case of radish. The following is the result of one experiment in lettuce. Electrically stimulated plants gave an average increased weight of 1.06 ounces per head, or a gain of 12.43 per cent. over plants grown under the same conditions but without electricity.

Forcing Tomatoes. Last year one house was devoted exclusively to the growing of tomatoes under glass. The same house was used this year, growing two crops during the season. Some work with fertilizers on tomatoes was also done, but results do not warrant the publication of the same as yet.

Plants were trained to single stem and spaced two feet apart each way.

The following table shows the relative productiveness of the varieties under test, also the average size of the fruits; but it does not show colour, shape and quality of the fruit. Of the varieties tested, the following are to be recommended:—Lester's Prolific, Hubert's Marvel, of the smaller fruited varieties, and Chalk's Jewel for a variety producing larger fruit.

Yield of Tomatoes in Forcing House.

Variety.	Sub-irrigated.			Surface watered.			
	Average weight of fruit per plant.	Average number of fruits per plant.	Average weight of individual fruits.	Average weight of fruit per plant.	Average number of fruits per plant.	Average weight of individual fruits.	Percentage of gain of sub-irrigated over surface watered.
	ounces.		ounces.	ounces.		ounces.	p.c.
Lester's Prolific..	121	39	3.1	102	34	3	18
Don.....	109	37	2.94	92	32	2.87	19
Hubert's Marvel.	105	33	3.18	91	30	3.03	15
Comet.....	102	36	3.93	94	24	3.91	8
Chalk's Jewel...	100	19	5.26	75	15	5	33
Frogmore.....	99	25	3.96	71	24	2.96	36
Stirling Castle...	88	26	3.38	79	27	2.92	11
May's Favorite..	83	19	4.38	53	13	4.07	57

It will be noticed in the above table that the sub-irrigated bed gave yields ranging from 8 per cent. to 57 per cent. larger than the yields from surfaced watered beds. The sub-irrigated bed was watered by means of a row of ordinary drain tile, placed lengthwise of the bed on a cement bottom with about six inches of soil in the bed. The water leaking out at the joints of the tile is brought up by capillary action to the feeding roots of the plant, leaving the surface of the soil open. Surface watering, on the other hand, tends to pack the surface soil. Sub-irrigation tends to the production of earlier fruits. It was noticed that tip rot was worse on the surface-watered bed than on the sub-irrigated.

The White Fly was kept in check by fumigation with hydrocyanic acid gas. For a full account of the method of use, see page 150, Report of 1907.

Lettuce. Two beds of Grand Rapids lettuce of three hundred and twelve plants each were set out with plants eight inches apart. On one sub-irrigation was used, the other being surface-watered. The results were as follows:—

Three hundred and twelve plants on the surface-watered bed produced 1,841 ounces, or an average of 5.9 ounces per head. The same number of plants on the sub-irrigated bed produced 2,006 ounces, or an average of 6.43 ounces per head. This shows a gain in favour of sub-irrigation of .53 ounces per head, or practically nine per cent.

Canning.

Experiments were begun in 1907 in the use of a home-canning outfit, with the object in mind of determining the practicability of canning fruits and vegetables in a small way. The operations connected with the packing of these materials in tin cans are not at all difficult to perform, and while there are believed to be many cases in which outfits of this kind could be used to advantage, we desire to draw attention to the points which must be considered before undertaking this work. They are: 1. Cost of outfit, cans, etc.; 2, cost or market value and availability of labour; 3, cost or market value of raw materials; 4, value of finished product in the open market. The cases in which it is believed to be possible to use one of these outfits to advantage are: 1. Where there is a supply of raw material for which no other profitable outlet is open. Only in those cases where the market price of the finished product warrants the expenditure of the necessary time and trouble should this means of disposing of a surplus be undertaken. It must be understood that a small outfit cannot put up goods as cheaply as a large factory, and careful calculations should precede every attempt. 2. A number of households might profitably combine in the purchase and operation of a small plant for the production of an excellent article for home consumption. This may be done very economically and a splendid grade of goods may be put up.

We have this year made use of a home canning outfit for the packing of tomatoes, and have put up eight hundred gallon cans in this way. The average number of cans per bushel in this season's work is six and a half. The gallon can, so-called, holds from six and a quarter to six and a half pounds of actual tomatoes. The juice of the tomatoes furnishes all the liquor required. They were exhausted fifteen minutes and processed seventy-five minutes.

Following is a statement of the cost of canning. The plant was operated one or two days each week during the picking season as occasion required. The figures given are for one afternoon's work, and are believed to be representative in all respects of the season's operations:—

110 gallon cans at 6c.	$ 6.60
Freight on cans	.20
17 bush. tomatoes at 27½c	4.67½
1 man washing, scalding, and tending fires, etc., 5 hours at 15c	.75
1 man wiping, capping, sealing, and processing, 6½ hours at 15c	.97½
4 hands peeling and filling cans, 16 hours, at 12½c. per hour	2.00
Solder	.20
Fuel	.50
Depreciation of plant	.75
Interest on capital invested in plant	.37½
	$17.02½
Leaks and swells 2 per cent. loss	.34
Total cost of remaining 98 per cent., or 107.8 cans	$17.36½

Or 16.10c. per gallon can.

Respectfully submitted,

J. W. CROW.

PART XIII.

THE PROFESSOR OF LANDSCAPE GARDENING.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to present herewith my sixteenth annual report, not, as in previous years, on the whole field of horticulture, but on what may be called the aesthetic branches of that subject, viz., Landscape Gardening and Floriculture.

REORGANIZATION.

I am pleased that horticulture has reached a stage in this Province when specialists are demanded in every branch of the work, and that in accordance with the recommendation made in my last report, the work here has been divided so that we who are engaged in it may concentrate our efforts on those branches which require the most attention. Mr. J. W. Crow has been given charge of that part of the work connected with fruits and vegetables, with Mr. McMeans to assist in the vegetable gardening. Mr. Crow will, therefore, report directly upon the work in connection with fruits and vegetable growing.

I have chosen to specialize upon the aesthetic rather than the economic branches, not merely because these have always strongly appealed to me, but because there appears to be the greatest call for help along these lines at the present time. Requests for information regarding landscape gardening as applied to both rural and civic improvement are coming from all sections of the country more urgent than ever before.

Floriculture has already attained considerable prominence in this country as a commercial industry, and that the interest in it by amateurs is ever increasing is evidenced by the numerous letters received by this department. Mr. Wm. Hunt is in charge of this branch of the work, and his practical talks and demonstrations to our students have proved that he is the right man in the right place. His report will be given herewith.

I. LANDSCAPE GARDENING.

TEACHING. A regular course of instruction in landscape gardening as applied to the beautifying of rural and urban homes has been given to students of the Macdonald Institute taking the Horticulture course, and to sophomore students of the College; while a more advanced course, as outlined in the College calendar, has been given to senior students taking the Horticulture option. To the students attending the summer school, a short course of lectures was given, in which emphasis was placed upon the improvement of school grounds.

Conventions and Meetings.

The re-arrangement of work here has enabled me to attend many more outside meetings than usual. During the year, I have addressed one or more meetings at the following places:—Guelph, Hespeler, Goderich, Chatham, Grimsby, St. Catharines, Waterdown, Durham, Simcoe, Dunnville, London, Walkerville, Amherstburg, Leamington, Hamilton, Smith's Falls, Cardinal, Napanee, Picton, Bowmanville, Woodstock, Waterloo, Galt, Springfield, Port Dover, Oakville, Stirling, and Toronto.

Assistance was also given by judging at exhibitions at the following places:—Simcoe. Guelph, Acton, Fergus, and Toronto.

Improvement of School Grounds.

At the request of the Department of Education, a bulletin was prepared last summer on the "Improvement of School Grounds." This is now in press and will soon be ready for distribution by the Department of Education at Toronto.

We believe that the general improvement of school grounds is one of the important matters requiring the attention of all concerned at the present time, not only because of the educational value of beautiful surroundings on the rising generation, but because the school is one of the centres of interest for every section, and by well laid out and beautifully planted grounds it may be made to afford valuable suggestions for the improvement of home surroundings throughout the section. We are hopefully looking forward to a general advance in this respect in the near future, and will be pleased to communicate with any teacher, inspector, or board of trustees desiring suggestions for the improvement of their school grounds. Plans are now in hand for the improvement of several school grounds upon which the work will be commenced next spring.

Improvements at Other Public Institutions.

At the request of the Inspector of Asylums and Prisons of the Province, I looked over the grounds of the Provincial Asylums at London, Penetanguishene, and Hamilton, and gave suggestions for their improvement. At Penetanguishene, a large part of the grounds in front of the main building needs grading and planting. At the other two institutions, the main thing needed is a judicious thinning of the trees which have become too crowded, and at Hamilton cutting out a large number of spruce scattered about the grounds, the natural beauty of which has been destroyed by the foolish practice of clipping into unnatural form.

Changes on College Grounds.

Alterations and improvements on the College grounds are found necessary from year to year. The most marked change this year being the removal of about forty full-grown Norway spruce in the row along the front of the lawn. These trees were planted twenty-five feet apart in a windbreak thirty-three years ago, and had reached an average height of about sixty feet; but they were getting very unsightly through the dying out of the lower branches, many of which had a spread of ten feet on all sides of the trunk. The killing of the lower branches was no doubt due partly to the shading

by the adjoining row of maples and partly to the strong west winds to which they were exposed. In place of the spruce, groups of hardy shrubs will be planted in a year or two when the ground can be got into good condition.

In this connection I wish to express my appreciation of the valuable services of Wm. Squirrel, foreman in this department. It was he who planted these spruce trees thirty-three years ago, and he who directed operations in their removal this fall.

II. FLORICULTURE.

The following report on the work in floriculture has been prepared by Mr. Wm. Hunt, who has charge of this branch of the work:

Teaching. The course of instruction as outlined in the College curriculum has been given to the second and fourth year students and to the Macdonald classes taking the course in Horticulture. The summer class in Nature Study taking Elementary Agriculture was also given a series of twelve lectures on floriculture. Each year the necessity for a more extended course in floriculture along commercial lines for the graduating class in horticulture becomes more apparent.

Outside Lectures. Lectures have also been delivered to Horticultural Societies at the following places: Owen Sound, Port Elgin, Midland, Barrie, Stratford, Clinton, Mitchell, Seaforth, Hamilton, Elmira, Guelph, Cayuga, Toronto, Walkerton, Collingwood, and Thornbury. At some of these places, I addressed gatherings of school children in the morning or afternoon. Addresses were also given at Ontario Horticultural Association Meeting, Toronto, and at Women's Institute Convention, Guelph.

I also acted as judge at the following Horticultural Exhibitions: Stratford, Elmira, Elora, Fergus, Brantford, Cayuga, Owen Sound, and at the Guelph Central and East Simcoe (Orillia) Fall Fairs.

The Greenhouses.

The greenhouses are taxed to their utmost capacity, as much space as possible being devoted to growing plants suited for the class work. With the increasing classes, necessarily a larger amount of space is required for practical laboratory work.

A number of new chrysanthemums, geraniums, and other plants have been added to our plant list so as to include varieties of recent introduction.

Fumigation with Cyanide of Potassium.

Further tests have been made with the use of hydrocyanic acid gas for exterminating the White Fly (*Aleyrodes vaporariorum*) and the Black Aphis in greenhouses. After repeated tests, there appears to be no reason for changing materially the formula and methods recommended in our last report for the use of cyanide of potassium for the extermination of the White Fly. Experiments were made with the ventilators open about an inch, so as to give somewhat the conditions of a leaky or poorly glazed greenhouse. The greenhouse in which the tests were made is sixty-four feet in length, eighteen feet in width, and eleven feet in height at the ridge, with seven ventilators, each four feet by two feet, placed at regular intervals on one side of the roof. The materials used for fumigation were:—¼ ounce cyanide of potassium, ½ ounce sulphuric acid, 1 ounce water to every thousand cubic feet of space. The material was divided into four equal quantities, four jars being used. The fumigating was done late in the evening. The results could

scarcely be called satisfactory so far as the complete destruction of the fly was concerned, for although many were killed, some live ones yet remained. The tender plants, however, were not injured, as was the case in tests previously reported. The results go to show that a comparatively tight house is necessary to effective fumigation for this pest.

For destroying the Black Aphis or Black Fly on Chrysanthemums, it was found that a stronger application is necessary, about one-half more of each material being required to the one thousand cubic feet of space. Better results also have been obtained by dividing the amount of material used into smaller quantities than first recommended, so as to distribute the fumes as evenly and quickly as possible throughout the entire house. The best results have been attained by having a jar or vessel of the material placed at least every twenty feet throughout the length of the house. The density of the foliage of these plants and the greater vitality of the Black Fly as compared with the White Fly are factors necessitating stronger fumigation.

An easily applied, safe, and effective remedy suitable for amateurs to use for the eradication of the White Fly on house plants has not yet been discovered. The remedies just described should not be attempted in a dwelling house because of the deadly nature of the fumes evolved.

Test of Out-door Roses.

In the spring of 1907, a collection of about one hundred and thirty varieties of roses were planted in the garden, consisting of bush and climbing varieties, including hybrid perpetual, hybrid tea, polyantha and tea roses.

They were given good cultivation and made a fair growth the first season. Various methods were tried of protecting the bushes for the winter. Some of the bush roses were banked with earth for a foot or so about the canes, some were banked with manure only, and some with leaves and strawy manure with board cover. The climbing roses were laid close to the ground and covered with four or five inches of strawy manure. So far as a comparison of results was concerned, but little difference was noticed in the different methods.

Bush Roses. All of these that came through the winter satisfactorily flowered last summer (1908). The hybrid tea varieties, such as American Beauty, Meteor, Richmond, and other tender varieties, were many of them badly winter killed, even where well protected. Some of the more hardy hybrid perpetual varieties budded or grafted on the briar or manetti stock were also winter killed or badly weakened. Bushes on their own roots, while probably not making quite as strong growth as those budded or grafted, came through the winter almost without exception in very good condition. This goes to show that hybrid tea roses, of any variety, are not so desirable for planting outside in this locality or in northern sections of Ontario.

Climbing Roses. There were twenty varieties of climbing roses in the collection, most of which wintered fairly well with the protection given. Maddalena Scalarandis was the only variety killed out entirely, although some of the Polyantha and Soupert type of climbers were partially winter killed. Among the most promising newer varieties in the collection are May Queen, Pearl Queen, Wm. C. Egan, and Queen Alexandra. The last named is a beautiful free blooming, attractive rose, rivalling the popular Crimson Rambler in the size of its panicles of flowers, the color being a pretty pale pink. Further tests must be made, however, before any very definite results can be published.

Tender Tea, Hybrid Tea, and Polyanthia Roses. Very few of these came through the winter satisfactorily, notwithstanding the careful protection given them. Of those that survived, Hermosa, Baby Rambler, Killarney, Clothilde Soupert, Queen's Scarlet, and Gen. de Tartas came out the best. Hermosa proved to be the hardiest of the lot. The bushes of this variety bloomed profusely the greater part of the summer.

Good Roses for an Amateur's Garden.

From the data at hand, we would recommend the following as a few of the most desirable hardy roses for the amateur's garden:—

Hybrid Perpetual Bush Roses.

Abel Carriere. Crimson.
Anna de Diesbach. Pink.
Baron de Bonstetten. Very dark crimson.
Countess de Roseberry. Shell pink.
Dinsmore. Dark crimson.
Eugene Furst. Velvety crimson, shaded maroon.
Earl of Dufferin. Velvety crimson.
Exposition of Brussels. Dark purple crimson, fiery centre.
Francois Levet. Rosy crimson.
Frau Karl Druschki. White.
General Jacqueminot. Scarlet crimson.
Jean Liabaud. Deep crimson.
John Hopper. Rosy pink.
Louis Van Houtte. Dark cherry red.
Marshal P. Wilder. Dark red.
Oakmont. Soft pink.
Mrs. Sharman Crawford. Rosy pink.
Prince Camille de Rohan. Crimson maroon.
Paeonia. Bright crimson.
Soleil d'Or. Yellow.
Ulrich Brunner. Crimson scarlet.

Moss Roses.

Blanche Moreau. White,
Countess de Murinais. Blush white.
Crimson Globe. Crimson.
Pricess Adelaide. Pale pink.
Crested Moss. Pink. Heavily mossed.

Rugosa Roses.

Agnes Emily Carman. Crimson. Semi-double.
New Century. Pale flesh pink. Double.
Sir Thos. Lipton. White. Double.
Rosa rugosa. Crimson. Single.
Rosa rugosa alba. White. Single.

Climbing Roses.

Crimson Rambler. Crimson. Double.
Dorothy Perkins. Pale pink.
Queen Alexandra. Pale pink. Single.
May Queen. Pink. Double.
Pearl Queen. Pale pink. Double.
Wm. C. Egan. Pale pink. Double.

Gladioli.

Several thousand corms of these popular flowers were planted in May, which made a grand display of bloom during July, August and September.

Tests were made of several collections of named varieties, and of mixed collections of the newer unnamed hybrids now offered in dealer's catalogues. It was quite evident that there are now among the newer unnamed hybrids many types far superior to the older named varieties. These can now be obtained so cheaply that they should be grown in quantity in every amateur's garden.

Respectfully submitted,

H. L. HUTT.

PART XIV.

THE PROFESSOR OF POULTRY HUSBANDRY.

To the President of the Ontario Agricultural College.

SIR,—I have the honour to present herewith the report of the Poultry department for the year 1908.

Teaching as heretofore includes lectures to the regular College students, to Short Course students; and lectures at Poultry Shows, Poultry Institutes and Farmers' Institutes. This part of my work scarcely needs a detailed report.

During the year many improvements have been made to the department. Early in the spring the old worn out wire fences were taken down and new wire put in their places. This was badly needed as the old wire had become so worn or decayed that a bird could break it at almost any spot, hence it was practically impossible to keep the flocks separate. The new wire is much heavier and stronger than the old and should wear well.

The wooden floors of Houses Nos. 1 and 2 were taken out and cement floors put in. So far these floors have worked well and have also been successful in keeping out the rats. For a number of years we were unable to rid the houses of these pests, and they undoubtedly destroyed much grain as well as numerous small chickens. The cement floors were made with a fairly smooth finish.

The pens have been arranged somewhat differently so as to increase the number of birds per pen, and also to give a larger grain room. We can now store about five hundred bushels of feed which should enable us to buy in large quantities and save money.

The old long, narrow house, situated at the end of house No. 1 and known as the cock pens has been moved to a higher and more cheerful situation. In their old situation these pens were of little or no use to us for the reason that the building was so close to rows of evergreen trees that no sunlight could enter the pens. This house has been put upon a cement foundation about half way between the brooder house and house No. 1. The house will now be very useful to us, especially for small matings of specially selected breeders.

Not the least of the improvements has been the erection of a fine brick incubator house. This building is about 66 feet long and 40 feet wide and should give ample accommodation for all incubators that we may need for years. The interior of the building is divided into three incubator rooms of different sizes with different methods of ventilation. We have a good sized store room above the incubator rooms, of which we were greatly in need. We sincerely hope with this new building and with the aid of the Science departments of the College to successfully continue the studies in incubation that we commenced a few years ago.

EGG PRODUCTION.

There can be no doubt but that egg production is one of the most profitable branches of poultry keeping, and it is therefore important that we

should devote considerable time in testing various methods of breeding, feeding, housing, etc., with a view to increasing the production per hen and also to decreasing the cost per dozen. Under this head we have to consider housing, breeding, feeding, etc.

Poultry Houses.

Four years ago there were built four styles of buildings large enough to accommodate an ordinary flock of forty or fifty birds each. These houses have been fully described in previous parts, also in Bulletin 151. The results, so far as winter egg production is concerned, has been practically the same each season; that is, the coldest or cheapest house built of single ply boards has given the best results, and the warmest, built of several thicknesses of board and paper with a four inch dead air space between the walls, has given the poorest results each winter. The houses of intermediate type have done very well; in fact, during the winter of 1907-08 they did nearly as well as the cold house. It may be of some interest to give the egg production from five White Wyandotte sisters of the same age in each of the four houses for December, January and February, 1907-8.

———	December.	January.	February.	Total.
Cold House	43	50	47	140
Warm House	.....	23	21	46
Curtain Front House	15	50	50	115
House with adjustable window	2	37	31	70

The following results were obtained in the same houses from six half sisters of the Buff Orpingtons breed.

———	December.	January.	February.	Total.
Cold House	2	61	87	150
Warm House	22	46	63	131
Curtain Front House	23	34	60	117
House with adjustable window	52	58	63	173

It will be noted that the curtain front house with the Orpingtons did not do so well proportionately, but this may be accounted for by the fact that the pullets in this house were younger than those in the remaining houses; the other pullets were all hatched on the same date, May 2nd, 1907.

The Orpingtons have usually laid better than the Wyandottes in the warmest house. There was one exceptionally good laying pullet in the house with adjustable windows which brings up the record somewhat, but the fact remains that the Orpingtons in this house did best. The Wyandottes usually do as well in this house as the Orpingtons.

Each season the Wyandottes eat the grass in the runs much closer than the Orpingtons; this applies to every pen. This would indicate that Wyandottes require more green food that do Orpingtons.

Last year mention was made of tests of flocks of 50, 75 and 100. These birds are all housed in the same building and each flock has the same floor space per bird. From the results obtained from the past two winters there is not enough difference between the pens to warrant any conclusions, but

what difference there is, is slightly in favour of the flock of 50, as was the case in 1907. This year the flock of 75 did poorer than the flock of 100, which would appear to be caused by an error in feeding or selection, both of which we tried to avoid. For the test of 1908-9 we have the flocks sorted to exact ages, breeding, etc. It is, of course, too early to predict results yet as the pullets are just nicely beginning to lay; but nevertheless the egg production in the pens is very similar.

Trials of some other methods of housing, some of which are very cheap, and somewhat inconvenient, (owing to being very low down,) are being made this season.

Breeding.

Numerous are the inquiries as to which breed really does lay the best. Unfortunately I cannot see that any one breed does lay the best. There are good and bad individuals and families in all breeds. Trap-nests are now used with most breeds and we hope to have them in all the pens this winter. Birds that do not lay more than 100 eggs in ten months of any breed trap-nested are not retained as breeders, and in some varieties we make the standard 120 eggs; while in our special selected pen for the breeding of males, only females are used that have laid 200 eggs or better in 365 consecutive days. It may not be possible to produce a 200-egg strain, but one should be able to have a flock average about 150 eggs per year. The entire flock here has not done this since I have been in charge.

Below is given the egg production to date (December 4th, 1908), of eight Barred Plymouth Rock pullets hatched the 15th of March, 1908. Four of these pullets are bred from heavy laying hens and bred in line for a number of years; the remaining four pullets are bred from the common flock of Plymouth Rocks, but by no means poor hens. These pullets were all hatched in the same incubator and reared in the same colony house and brooder, and have not as yet been separated from one another, so that all conditions except parentage has been the same. The pullets began laying in August. The pullets bred from the best layers have laid 230 eggs, laying individually 74. 60, 55 and 41 eggs. The other pullets have laid 106 eggs, laying individually 38, 30, 23, and 15 eggs.

Feeds.

One cannot lay down any hard and fast rules for feeding, because the feeds available and the price of the same frequently cause changes to be made. To the laying birds, especially the pullets, we feed some wet mash and have dry mash constantly before them, just now the dry mash is composed of equal parts, by measure of bran, low grade flour and barley chop or meal; the wet mash is composed of boiled vegetables, waste bread and the same meals that are used in the dry mashes. Occasionally a little kitchen refuse, bones and meat are boiled with the vegetables. These are practically waste products and we find it makes the vegetables and meat more palatable to cook them, using the liquor to moisten the bread.

We find the kitchen waste is especially good to develop the pullets. The old stock, for dry mash, have nothing but wheat bran. The wet mashes are fed to all the stock at 3.30 each afternoon; during the winter not more than four times each week and none, or very rarely during the summer, our experience being, that at this season of the year, the birds occasionally get too fat by feeding too much wet mash, and moreover, our spare time is usually required with the growing stock.

Whole wheat is fed in deep litter each morning, a little more about noon, together with either whole mangels or clover hay,— the green food we consider very essential. Just before dark whole corn is given, all the birds will eat. During the spring and summer months but two feeds a day are given, morning and night. Then corn, unless low in price, is not used, wheat or barley taking its place. We also keep in front of the birds a hopper of beef scrap or else feed some green cut bone sometime during the day. We have difficulty getting bones in sufficient quantities that are fresh, otherwise we would feed more of them.

Hatching.

We use both the natural and artificial methods. Bulletin 163 published early in the year gives a detailed account of our experiments. We have nothing of particular interest to add to this at present as such experiments as have been conducted since the publication of the bulletin are as yet incomplete.

Rearing.

The importance of sufficient range, if possible, over new ground or at least ground that is well tilled is worthy of serious thought. We raised this season about 700 chickens in the College orchard (nearly 20 acres in extent), and the range was none too large to grow the chickens to their best. Where the land is cultivated, or at least a portion of it, the supply of tender green food in the way of germinating weed seeds, etc., supplies ideal green food, and at the same time gives the chicks a place to scratch. The birds have not been destructive, not even to small fruits, some of which are near by; but it must be remembered that hoppers of wheat and corn, and dry mash are near each colony house, so the birds are well fed. If they were under fed or allowed to go hungry, at times, they might develop bad habits, especially during the tomato season.

We use a 6 x 8 colony house, and brooders or hens in the house. These houses are movable and are moved from place to place in the field or to new fields. The birds are fed about once each week and barrels of water are drawn about twice each week. The chicks are shut in every night and let out the following morning. We have found board floors necessary in the colony houses in order to keep out rats, skunks, etc. The chicks are put in the house when hatched and remain there until ready to fatten or to go into the laying houses. The laying pullets are hatched mostly during April and May and put in the laying houses about October 1st, so that they may become accustomed to their new home before the bad weather begins. Should they show signs of laying earlier the change is made at an earlier date.

Fattening.

We have each year a surplus of cockerels over and above those required for breeding purposes, and the most of these are fattened and killed; a few are sold to farmers for breeders. We also fatten the cull pullets. This year from September to December we put in the fattening crates 626 birds. The loss by death among these was 2 birds. The birds weighed, (when brought in from the range, usually with full crops) 2,233 pounds. They were fed from four days to three weeks before killing.

We hoped to have fed them all three weeks but at times the demand for dressed chickens required us to kill the birds shortly after cooping.

Rations.

The main ration consisted of barley meal, low grade flour, middlings and buttermilk. Some other mixed grains were used and a little shredded wheat. The 626 birds ate 2,057 lbs. of ground grain and 4,000 lbs. milk.

Many farmers and others market their birds in a thin condition. We can, for the time it takes to feed, clean out the pens, etc., make at least 50 cents per hour over and above the cost of feed. We usually feed these birds by lamp light at night so little valuable time is lost.

Financial Statement of Fattening Chickens.

626 chickens weighing 2,233 lbs. at 8c. per lb. live weight....	$178 64
2,057 lbs. grain at $1.50 per cwt.	30 85
4,000 lbs. buttermilk at 10c. per cwt.	4 00
Total cost.....	$213 49
624 dressed Chickens, bled and plucked, but undrawn, 2,358 lbs. at 12½c. per lb.	294 75
Profit.....	$81 26

Birds that are starved ready to kill shrink nearly 12 per cent. by bleeding and loss of feathers. We have figured frequently that the average profit per bird in three weeks' feeding was about 15 cents each, the above table shows nearly 13 cents. The profit would have been somewhat higher if all the birds had been fed at least two weeks.

Fattening Experiment No. 1.

Nine cockerels hatched June 8th, commenced to fatten Nov. 2nd, killed Nov. 28th. Parentage—sire, Buff Orpington cockerel; dam, black mongrel hen, resembling Black Leghorn. Laid eggs averaging 2¼ ounces each.

Ration fed, by weight,—2 parts barley meal, 1 part low grade flour and 1 part bran mixed with buttermilk.

No of Legband.	Weight at Commencement.		Weight before killing, starved 14 hours.		Weight after bleeding and plucking.	
	Lbs.	Oz.	Lbs.	Ozs.	Lbs.	Ozs.
1654	4	3¼	4	13¾	4	5
1659	4	5¼	4	15	4	5
1662	3	3¾	4	10	4	0½
1666	4	13½	5	15¾	5	3¾
1676	3	13	4	14½	4	6
1677	3	10½	5	1¼	4	8½
1691	4	3¾	5	6¾	4	13
1692	4	4¾	5	12¼	5	2
1695	4	9½	6	1¾	5	7½
Totals.....	37	3¼	48	4	42	3¼

Fattening Experiment No. 2.

Six cockerels, pure bred Rhode Island Reds, hatched June 1st, commenced fattening Nov. 2nd. Killed No. 28th.

Rations as for Experiment 1.

No. of Legband.	Weight at Commencement.		Weight before killing, starved 15 hours.		Weight after bleeding and plucking.	
	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.
1759	3	15	4	$14\frac{3}{4}$	4	$6\frac{1}{2}$
1760	5	5	6	$7\frac{1}{2}$	5	$10\frac{1}{2}$
1761	4	$13\frac{1}{4}$	6	$1\frac{1}{4}$	5	$8\frac{1}{2}$
1762	4	$9\frac{1}{4}$	5	$13\frac{1}{4}$	5	2
1763	5	$1\frac{1}{2}$	6	$4\frac{1}{4}$	5	$8\frac{3}{4}$
1764	3	$13\frac{1}{2}$	5	$4\frac{1}{2}$	4	$11\frac{1}{2}$
Totals.....	27	$9\frac{1}{2}$	34	$13\frac{1}{2}$	30	$15\frac{3}{4}$

In conclusion allow me to thank you for the interest you have taken in the Poultry department. My many thanks are due to the professors of various departments for assistance in many ways. I can not close without recording the faithful services of J. R. Terry.

Respectfully yours,

W. R. GRAHAM.

PART XV.

THE PROFESSOR OF FIELD HUSBANDRY AND DIRECTOR OF FIELD EXPERIMENTS.

To the President of the Ontario Agricultural College:

SIR,—I have the honour of submitting herewith, the report of the work done in the Department of Field Husbandry for the year 1908. The work along the different branches has been carried out with a good deal of satisfaction during the past year. The students have shown much interest in the lectures, in the laboratory exercises, and in the practical work in the field; the experiments at the College have furnished us with some very valuable information; and the co-operative field experiments throughout Ontario have been more extensive and more thorough than in any previous year. I believe that these different lines of activity are having a wholesome influence in the education of the people of our province, who are engaged in farming, and also in the advancement of the agriculture of Ontario.

The duties of the Department of Field Husbandry, are certainly numerous, as can be learned from a glance at the following outline of the work of the past year.

1. The delivering of lectures and the giving of demonstrations in the class room, the laboratory, and the field, before the classes in the regular College course, as outlined in the College Calendar, also before the students taking the Dairy course, the Nature Study course, and the course in Elementary Agriculture.

2. The directing of short courses in Seed Judging at the Agricultural College, Guelph, at the town of Lindsay, Victoria Co., and at the Agricultural College at Truro, Nova Scotia, and the assisting for a short time, with the work of the short course at Macdonald College, Quebec.

3. The conducting of experiments in Field Agriculture, on about 2,000 accurately measured plots at the Agricultural College.

4. The improving of the leading varieties of cereal crops, by means of systematic selection and of cross fertilization, there being about 40,000 hybrid plants grown separately in the experimental grounds in 1908.

5. The directing of co-operative experiments on 4,420 farms throughout Ontario. The results of the successfully conducted experiments will be found in the annual report of the Ontario Agricultural and Experimental Union.

6. The delivering of addresses by the writer, at various gatherings of farmers and others throughout Ontario, as follows: Eight sessions of Farmers' Institutes held at Mt. Brydges, Appin, Glencoe and Wardsville, in Middlesex county, in February; three annual meetings of Farmers' Institutes in Frontenac, Hastings, and Perth counties, in the month of June; one at the Provincial Winter Show, Guelph; one at the Eastern Winter Show, Ottawa; one at a complimentary luncheon given at the City

Hall, Guelph, in connection with the Winter Show; one at the annual meeting of the Canadian Seed Grower's Association, Ottawa; three at the Ontario Agricultural and Experimental Union, Guelph; one before the members of the Ontario Legislature; one before the members of the Toronto Branch of the Manufacturers' Association; one before the members of the Press Association, when visiting the College; one at the Union Literary Society of the College; one before the pupils of the Macdonald Consolidated School, and a number before the Farmers' Institute excursionists, who visited the College in the month of June. Besides these, the writer delivered twelve addresses at the Agricultural College of Truro, Nova Scotia, three addresses at the Macdonald College, Quebec, one address at Cornell University, Ithaca, N.Y., and one at St. Johns, Newfoundland.

7. The writing of agricultural reports and articles, including the report of the Experimental department of the College, the report of the co-operative experimental work in agriculture throughout Ontario, a bulletin on Alfalfa or Lucerne, and also the articles which are sent to the farm journals and newspapers throughout the year.

8. The carrying on of a very large correspondence with farmers, seedsmen, fertilizer manufacturers, experiment station officers, and others, throughout the entire year. At some seasons of the year the letters received number one hundred and fifty to two hundred per day.

9. The judging of grains, roots, potatoes, etc., at Agricultural exhibitions, as follows:

Fall Exhibition, Guelph; National Exhibition, Toronto; Provincial Exhibition, Truro, Nova Scotia; Spring Seed Fair, Guelph, and Autumn Seed Fair, Guelph.

10. The furnishing of plans, seeds and instructions for demonstration plots at the exhibition grounds at Simcoe, Ontario, and for experimental plots in connection with the High Schools at Lindsay, Victoria county; Perth, Lanark county; Morrisburg, Dundas county; Collingwood, Simcoe county; Galt, Waterloo county; and Essex, Essex county.

11. The fulfilling of duties required of the Secretary of the Ontario Agricultural and Experimental Union; the Vice-President of the Canadian Seed Growers' Association; the Chairman of the Committee on Breeding Cereals, of the American Plant Breeders' Association; the Secretary-Treasurer of the Macdonald Consolidated School; and a member of the Seed Committee of the Ontario Provincial Winter Fair.

I wish to publicly express my great appreciation of the excellent services rendered by the efficient and willing staff of workers in my department. Mr. John Buchanan, B.S.A., lecturer in Field Husbandry, has taken more than one-half of the lecturing in connection with the regular College course. He has also conducted all the students' examinations during the past year, with the exception of those in connection with the final examinations given to the senior class. Mr. Buchanan acted as judge in the Seed Department of the Provincial Winter Fair, and also attended several Farmers' Institute meetings in Western Ontario. Mr. W. J. Squirrell, B.S.A., has done excellent work, especially in the taking of notes in the Experimental Department, in the preparation of material for the reports, in imparting information to the farmers when visiting the College in excursion parties, in the month of June, etc. Mr. A. E. Whiteside, who has been foreman in the department for at least a dozen years, has had charge of the men and the students when at work in connection with the various experiments, and has also given excellent assistance in planning experiments and in making careful records of the same. Mr. C. R. Klinck, B.S.A., and Mr. A. W. Mason, B.S.A., have devoted nearly the whole of

their time to the work in Plant Breeding, which is now being developed to such a large extent, and from which we hope to obtain results of much importance. Miss J. I. Coxon has been not only accurate and painstaking in her duties as stenographer, but has always been very obliging and deeply interested in her work.

Outline of the Experimental Work in Field Husbandry.

About fifty acres of land, divided into upwards of 2,000 plots, are used for experiments conducted with varieties of grain, root, tuber, grass, clover, fodder, silage, and other crops; with artificial, green, and farmyard manures; with methods of cultivation, selection of seed, dates of seeding, etc. All of these experiments are conducted with the greatest care, and for several years in succession in order to secure strictly accurate results. These experiments deal with the crops grown on over nine-tenths of the cultivated land in Ontario.

The grounds have a gentle slope towards the southwest, and the soil is an average clay loam. About one-quarter of the land is manured each year with twenty tons of farmyard manure per acre; thus most of the land receives an application of farmyard manure once every four years. No commercial fertilizers are used except in distinct fertilizer experiments, and these occupy only a small number of plots each year. Within the past eleven years one green crop has been plowed under on each section of the field. The plots vary in size according to the requirements of the different experiments, and the yields per acre are determined from the actual yields of the plots in every instance.

The work in the Experimental department consists in planning the various experiments; laying out, seeding, and looking after the field plots; harvesting, threshing, weighing and testing the grain; taking up, weighing, counting, testing and storing the potatoes and roots; cutting, weighing, and harvesting the grass, corn and fodder crops, etc., and also in picking by hand the samples of grain grown on the plots, some to be sown on the plots the following year and some to be distributed for co-operative experimental work throughout Ontario. A great deal of thought and care is required in planning, supervising and examining these plots, and in studying, comparing and summarizing the results for presentation in reports, bulletins, newspaper articles, and lectures.

Results of Experiments.

All of our field experiments are conducted for at least five years before conclusions are drawn, and many of them are continued for a much longer period of time. For the results of some of the tests which were carired on for five or more years previous to 1908, the reader is referred to former reports. The results of some of the experiments which have as yet been conducted for only one or two years, are withheld until the tests can be carried through for at least another summer. As different seasons vary so much in temperature, rainfall, etc., the average results of experiments continued for several years are of much greater value than those secured from only one or two years' work. Owing to the great care exercised in the work and the number of years through which the experiments are continued, we are able to present the results with much confidence in their reliability and in their practical value. From year to year the reports of the experimental work are being more widely read and more carefully studied by the farmers of the Province, and this is leading to a greater interest in crop production and a deeper knowledge of plant life on the farms of our country.

The Conditions of the Weather in 1908.

Before considering the results of experiments with farm crops at the College for 1908, it is advisable to observe the weather conditions under which those crops were grown. The amount and the frequency of the rainfall always exert an influence on the growth and the productiveness of the crops which are under test. In each of the past nine years, careful records of the rainfall have been kept in connection with the Physical department at the College. The following table gives the total amounts of precipitation in each of the six months of the growing season in each of the past nine years, as recorded at the College.

Month.	Amount of Precipitation during the six growing months.									
	1900	1901	1902	1903	1904	1905	1906	1907	1908	Average of 9 years.
April	1.69	2.24	2.43	2.69	2.10	1.82	1.44	1.66	1.33	1.93
May	1.03	3.26	1.67	2.44	3.01	3 89	2.71	2.64	3.47	2.68
June	4.47	1.53	3.06	3 05	2.86	3 24	4.06	1.11	3.21	2.95
July	3.05	4.07	6.43	2.67	4.99	4.60	4.65	1.92	3.25	3.96
August	.87	3.51	2.18	3.47	3.88	1.98	2.13	62	2.75	2.38
September	1.52	2.45	3.58	1.48	2.80	2.85	2.49	2.87	.73	2.31
Total	12.63	17.06	19.35	15.80	19.64	18.38	17.48	10.82	14.74	16.21

It will be seen from the accompanying table that the total amount of rainfall during the six months, from April to September inclusive, was 14.7 inches, while the average total rainfall for the same months in each of the past nine years was 16.2 inches. It will also be observed that there were about 4 inches more rainfall in the summer of 1908 than in that of 1907, but about 5 inches less than in 1904 and in 1902. The amount of rainfall in May, in June, and in August was somewhat above the average of the past nine years, while that of April, July, and September was somewhat below the average of the nine years. From an examination of the Crop bulletin for Ontario, issued by the Bureau of Industries in August of the present year, we ascertain that the rainfall throughout Ontario was somewhat greater than that at the College during the months of April and May, and was rather less in the months of June and July. No records for the rainfall for August and September have yet been received for the Province. The most noticeable feature in connection with the amount of rainfall at the College during the past summer has been the comparatively small amount of rain which fell during the month of September. It was less than one-half the amount of rainfall during September of any one of the eight years previous. This light amount of rainfall during the month of September of the present year had a marked influence on some of the root crops, especially on the swede and fall turnips which thrive best when the rainfall is good and the weather is cool. During the past September, however, not only was the rainfall very light, but the weather was warm and the ravages of the plant lice on the turnips and a few of the other crops was unusually great. With the exception of the month of September, the season was a comparatively favorable one for a good growth of farm crops. The results may be considered as fairly representative of those of an average season in the Province of Ontario.

Field Agriculture in Ontario.

Ontario is a Province possessing an area about equal to the combined areas of the six New England States along with that of New York, Pennsylvania and New Jersey. It is about four times as large as England, and practically the same size as Germany and France would be combined. The Province is about one thousand miles in length, which is nearly equal to the distance from Chicago to New Orleans or from London in England, to Rome in Italy. The width of Ontario is about seven hundred and fifty miles, a distance equal to that from Guelph to South Carolina or from New York to Chicago. In round numbers, Ontario contains 126,000,000 acres, of which 40,000,000 acres are surveyed and 24,000,000 are assessed. Of the 24,284,730 acres of assessed land in Ontario, 14,107,015 acres are cleared, 5,449,125 acres are woodland, 1,963,350 acres are slashland, and 2,765,240 acres are swamp, marsh, or waste land. The areas devoted to farm crops in Ontario in 1908 arranged in order of their extent are according to the last report of the Ontario Bureau of Industries, as follows:

Pasture	3,336,169 acres	Spring Wheat	142,124 acres
Hay and Clover	3,253,141 "	Buckwheat	140,605 "
Oats	2,774,259 "	Turnips	120,920 "
Barley	734,029 "	Rye	87,908 "
Fall Wheat	679,642 "	Mangels	67,937 "
Corn	533,443 "	Beans	46,477 "
Mixed Grains	456,049 "	Sugar Beets	17,453 "
Peas	396,642 "	Carrots	4,080 "
Potatoes	166,974 "		

The young men of the Province have plenty of room for their best thoughts and their deepest study in their endeavors to become thoroughly good farmers, in the highest sense of the term. The fertility and the cultivation of the soil, the ripening and the storing of the crops, the selection and the preservation of the seed, the feeding and the care of the farm stock, the breeding of the plants and the animals, and many other problems of great value and intense interest, require not only a practical training in the operations of the farm, but also a good knowledge of the underlying principles of agriculture and exceedingly good judgment in the application of those principles to the various operations on the farm. In agriculture, nature is a coworker with man. It is therefore essential that man know something of the laws of nature before he can expect to develop an agriculture of the highest type. Even the most common plants and animals, and the most humble operations on the farm are worthy of the best thoughts of the best men. In order to know which are the most valuable classes of crops to grow to meet the various requirements, the most desirable varieties of each class to furnish the largest amount of food of the best quality, the most suitable time and method to sow each variety to use advantageously the fertility and the moisture in the soil, etc., are all questions which every farmer should determine for himself. In this work, however, the Experimental department at the College is in a position to give a large amount of valuable assistance. As the market value of the farm crops of Ontario now amounts to $135,000,000 annually, we believe that it shows both good judgment and economy on the part of the Government to develop largely the experimental work in Field Husbandry at the College.

It is exceedingly gratifying to note that the average yield per acre of some of the principal farm crops is now increasing from year to year, owing

to the introduction of better varieties and to the improved methods of agriculture which are being adopted. There are yet exceptionally fine opportunities and almost unlimited possibilities for the agriculture of Ontario.

We can easily perceive that slight mistakes in the selection of the most suitable crops for growing in the various localities, while they may not prove disastrous, may easily result in considerable loss to the individual farmer. Sufficient thought has not been given to this phase of the question of crop production amongst our farmers. The selection of crops is necessarily governed to a large extent by the location of the farm, the quality of the soil, the particular kind of farming which is followed, etc. There are many things to be taken into consideration in the selection of those crops which are likely to give the best satisfaction.

Those classes of farm crops which have increased in area the most extensively during the past eight years are hay, pasture, oats, and barley, and those crops which have decreased in area to the greatest extent during the same period are peas, spring wheat, winter wheat and rye. It is quite probable that the decrease in the area devoted to the pea crop has been brought about largely by the ravages of the pea weevil in the southern part of the Province during recent years. As practically all of the farmers in some of the sections of Ontario, however, stopped growing peas for a few years, the trouble from the pea weevil has been greatly diminished in those sections, and the area devoted to the pea crop has been considerably increased during the past two years.

The increase in yields of grain per acre for the three principal cereals grown in Ontario for the eleven years, from 1897 to 1907 inclusive, over those for the eleven years, 1886 to 1896 inclusive, were as follows: Barley, 24.7 per cent.; oats, 16.9 per cent.; winter wheat, 12.9 per cent.; average, 18.2 per cent.

Most farmers know that oats will, as a rule, yield more bushels per acre than will barley, and that barley, in turn, is likely to yield more bushels per acre than wheat; but a bushel is a bulk measure and not weight measure, and the weight of grain produced per acre is of much greater importance than bulk. It is both interesting and instructive to compare the results of the various crops grown in Ontario under similar standards of measurement. The following table, which has been compiled from the reports of the Bureau of Industries, gives the average yields for twenty-six years in both bushels and pounds per acre of the grain crops, and of bushels and tons per acre of the root crop, as grown on the farms throughout Ontario:

Grain.	Yield per acre.	Yield per acre.
	Bushels.	Pounds.
Barley	27.7	1330
Winter Wheat	20.6	1236
Oats	35.8	1217
Peas	19.6	1176
Beans	17.1	1026
Spring Wheat	15.9	954
Buckwheat	19.6	941
Rye	16.3	913
Field Roots.		Tons.
*Mangels	462.0	13.86
Turnips	432.0	12.96
*Carrots	348.0	10.44

*Average for twenty-five instead of for twenty-six years.

It is interesting to note that the average yield of barley per acre exceeded that of oats by 113 pounds or by 9.3 per cent., and also that the average yield of mangels per acre surpassed that of turnips by 30 bushels or by practically 7 per cent.

For seven years in succession an experiment has been in progress at the College with the object of furnishing information regarding the relative productiveness of our principal grain crops, when grown under uniform conditions. In each of the six years, from 1902 to 1907 inclusive, twelve varieties of farm crops were grown in duplicate, making in all twenty-four plots in the experiment each season. In the spring of 1907, another experiment, made up of eight different classes of farm crops, was conducted in duplicate and therefore occupied sixteen plots. This experiment was repeated in 1908. The following table gives the average results of the twelve tests made during the six years, and of the four tests made in the past two years, in date of ripening, length of plants, percentage of rust, percentage of crop lodged, and of yield in tons of straw and in pounds of grain per acre.

Varieties.	Date of Ripening.	Length of Plants.	Percentage of Rust.	Percentage Lodged.	Straw per Acre.	Grain per Acre.
Average results for 6 years, 1902-7.		inches.			tons.	lbs.
Emmer (Common)	Aug. 17 ..	39	4	36	2.2	2,756
Barley (Mandscheuri)	" 4 ..	40	5	39	1.9	2,715
Oats (Joanette)	" 14 ..	38	7	41	2.7	2,559
Hulless Barley (Black)	" 4 ..	31	8	40	2.0	2,527
Early Oats (Alaska)	" 7 ..	41	10	53	2.1	2,395
Hulless Barley (White)	" 7 ..	33	6	59	1.9	1,992
Spring Wheat (Wild Goose)	" 24 ..	47	9	16	2.4	1,905
Spring Rye (Common)	" 14 ..	53	4	21	2.1	1,780
Field Peas (Early Britain)	" 21 ..	44	.....	.....	1.7	1,772
Flax (Common)	" 15 ..	28	.....	14	2.0	1,100
Grass Peas (Common)	Sept. 8 ..	50	.....	.....	2.2	753
Vetches (Common)	" 2 ..	34	.....	.....	1.6	595
Average results for 2 years, 1907-8.						
Emmer (Common)	Aug. 14 ..	39	2	18	2.0	2,916
Barley (Mandscheuri)	" 4 ..	33	2	6	1.8	2,761
Oats (Banner)	" 17 ..	44	7	30	2.1	2,701
Hulless Barley (Guy Mayle)	" 3 ..	24	6	21	1.5	2,483
Spring Wheat (Wild Goose)	" 21 ..	46	5	1	2.5	2,311
Field Peas (Early Britain)	" 17 ..	39	.....	.....	1.3	2,163
Spring Wheat (Red Fife)	" 21 ..	45	6	16	2.2	2,011
Spring Rye (Dakota Mammoth)	" 14 ..	50	3	3	1.9	1,769

It will be seen from the results of the two experiments presented in the accompanying table that several of the varieties have changed. Even in spite of this, however, the comparative results of the different classes of crops in the two experiments are very similar. The emmer, barley, oats, hulless barley and wild goose spring wheat are in precisely the same order in the two experiments. The comparative order of the spring rye and the field peas, are different in the two experiments. It will be observed, however, that in the first experiment the spring rye surpassed the field peas in yield per acre by an average of only 8 pounds per annum. In both experiments the oats suffered most from rust, and in both experiments the oats and the hulless barley

possessed the weakest straw. The stiffest straw in the first experiment was that of Wild Goose spring wheat and the flax, and in the second experiment that of the Wild Goose spring wheat and the Dakota Mammoth spring rye. A comparison between the result of the farm crops as grown throughout Ontario, and those grown at the Agricultural College forms a study of much interest and provides data of considerable importance. The fact that emmer has taken the lead in the production of grain in the average results of both the experiments at the College, speaks well for this new introduction into Ontario. For fuller information and for more detailed results regarding the emmer and the other classes of farm crops mentioned in the accompanying table, the reader is referred to the experiments enumerated throughout this report.

The Testing of Farm Crops Through the Medium of the Experimental Union.

Under the guidance of the Ontario Agricultural and Experimental Union, no less than 4,420 farmers throughout Ontario conducted co-operative experimental work in agriculture at their own homes in 1908. This organization is doing an admirable work in this Province. It forms a close connection between the scientific worker at the College and the practical worker on the farm. When the farmers themselves once become both interested and active in the carrying out of some important and well defined line of experimental work, they have entered upon a course of thought and action, the good results of which it is impossible to correctly estimate. This work not only enriches the lives and improves the farming operations of those actually engaged in the work, but it also tends to the betterment of agriculture generally.

Varieties of Farm Crops.

From a practical knowledge of farming operations in Ontario, and from the results already submitted in this report, it will be seen that we have a Province well suited for the cultivation of a considerable number of different classes of farm crops. While it is true that spring wheat is the great crop of Manitoba, Saskatchewan and Alberta, that corn predominates in Indiana, Illinois and Iowa, and that cotton is cultivated more extensively than any other crop in some of the Southern States, it cannot be said that Ontario is a one crop country. The conditions of soil and climate are particularly suitable for the cultivation of a number of different classes of grain, root, fodder, hay, and pasture crops. While it is of great importance for the individual farmers to study the various classes of crops to meet their own peculiar conditions and circumstances, it is also exceedingly important that they study with great care the leading varieties of each class with the object of securing those particular varieties most suitable for them to cultivate. After carefully watching the crop production of the province and closely observing the experimental work at the College for the last twenty-three years, the writer is thoroughly convinced that the selection of proper varieties is a question of great importance. Some varieties are particularly desirable, owing to the fact that they usually produce very heavy yields per acre, while others are desirable, owing to the fact that they are exceptionally early in maturing. Some varieties of grain produce very long straw and are particularly suitable for growing on land which is rather poor in quality, while other varieties naturally produce short straw and generally thrive well on

rich, mellow loams. In order to show more clearly some of the differences in varieties in regard to yield of grain per acre, we here present the average results from growing a few different kinds throughout long periods varying from thirteen to nineteen years.

Classes.	Number of years.	Varieties.	Average yield per acre.
			Bushels.
Oats	19	Joanette	87.7
		Siberian	87.3
		Egyptian	75.6
		Black Tartarian	71.8
Barley	19	Mandscheuri	71.2
		Oderbrucker	64.6
		Mensury	60.0
		New Zealand Chevalier	58.3
Winter Wheat	13	Dawson's Golden Chaff	55.4
		Imperial Amber	51 2
		Turkey Red	45.5
		Treadwell	44.8
Spring Wheat (Flour)	19	Saxonka	31.0
		Red Fife	30.7
		Colorado	27.9
Spring Wheat (Durum or macaroni)	16	Wild Goose	38.4
		Medeah	34.3
		Ontario	23.5
Potatoes	19	Empire State	225.5
		White Elephant	203.6
		Rural New Yorker No. 2	203.4
		Stray Beauty	161.5

It will be seen from the results here presented that there is a marked difference in the average results of the different varieties. As it is the policy of the Experimental department to drop the poorest varieties that they have been carefully testing for five years, it will be understood that the differences given in the table here presented are not nearly as great as many of those secured from the longer lists of varieties which have been grown for a shorter period of time. The figures here presented, however, show quite clearly that some varieties are apt to produce much more heavily than others when grown under similar conditions from year to year. For instance, there is an average annual increase in yield per acre of 15½ bushels from the Siberian over the Black Tartarian variety of oats, of 11.2 bushels from the Mandscheuri over the Mensury variety of six-rowed barley, of 10.6 bushels from the Dawson's Golden Chaff over the Treadwell variety of winter wheat, of 3.1 bushels from the Saxonka over the Colorado variety of spring wheat, of 14.9 bushels from the Wild Goose over the Ontario variety of durum wheat, and of 64 bushels from the Empire State over the Stray Beauty variety of potatoes.

It is important to know that although the different varieties of oats, barley, wheat, and potatoes have been grown in the Experimental department at the College for from thirteen to nineteen years in succession, the average yield per acre for the last few years is considerably greater than the average yield per acre for the first few years of the whole period in the case of each

of the varieties under experiment. As there was no change of seed from one farm to another during this length of time, it shows that it is quite possible to grow these crops for a considerable length of time without the introduction of fresh seed from other localities, providing proper care is exercised each year in the quality of the seed used.

Work in Plant Breeding.

For many years past we have given a good deal of attention to the improvement of our farm crops. This has involved a work, not only of endeavouring to attain a thorough knowledge of the varieties already existing in this country and in others, but also a systematic selection and the cross-fertilization of the leading varieties with the object of improving the very best which are grown at the present time. We have started a considerable number of new strains of cereals by selecting the most promising individual plants out of thousands which have been grown and examined. It is only within the last two or three years that we have been enabled to compare our selected strains started from individual plants with the regular variety work in the experimental plots at the College. In nearly all cases, we have been enabled so far to produce new strains which have given higher yields per acre than the variety from which the selections were made. This, however, has not been true in all cases, as in a few instances we have not yet secured new strains which are superior to those which we have grown previously. The following table gives the average of two and three years' results of the leading selected strains in comparison with the original variety in the case of a number of different varieties and classes of farm crops.

Class of Crop.	Variety.	Number of years.	Yield of Grain per acre (bus.)	
			Standard variety.	Selected Strain from Standard variety.
White Oats	Siberian	2	77.2	81.6
Black Oats	Joanette	2	70.2	82.0
Early Oats	Daubeney	2	84.9	87.8
Early Oats	Early Ripe	2	67.7	81.6
Sixed-rowed Barley	Mandscheuri	3	79.1	81.3
Two-rowed Barley	French Chevalier	3	51.8	47.9
Hulless Barley	Guy Mayle	3	40.0	40.5
Winter Wheat	Dawson's Golden Chaff	3	49.1	59.5
Winter Wheat	Bulgarian	3	37.2	38.0
Winter Wheat	Early Genesee Giant	3	42.5	44.2
Winter Wheat	Imperial Amber	3	40.7	40.6
Winter Wheat	Turkey Red	2	42.7	47.4
Spring Wheat	Red Fife	2	32.1	33.8
Durum Wheat	Wild Goose	2	29.4	28.3
Durum Wheat	Medeah	3	27.6	27.0
Millet	Siberian	2	40.2	46.9
Spring Rye	Saatroggen	3	30.4	33.6

The figures here presented in tabulated form show us that in nearly all cases the selected strains have given comparatively higher yields per acre than the varieties. In some cases, this increase is very marked, especially is this true in the case of Early Ripe oats, Dawson's Golden Chaff winter wheat, and Siberian millet. Some of the new types are not only heavier yielders, but are also different from the original stock in other characteristics. These differences have probably been brought about through natural cross-

fertilizations or through mutations in years past. To any one wishing to study more carefuly the influence of work carried on in selection, the writer would refer him to a book entitled "Plant Breeding," written by Hugo De Vries and printed in 1907 by the Open Court Publishing Co., Chicago.

The work in hybridization during the past year has been considerably increased. We are now beginning to see results of work conducted in former years. In 1908, we had in the Experimental Department in connection with the work in hybridization alone about 40,000 individual hybrid plants, 626 row plots, 97 plots each twenty-five links square, and 20 plots each ten links wide by one hundred links long. Some of these hybrids are showing much promise, while others are inferior. We believe that we are making fairly good progress in our endeavours to combine, through cross-fertilization, the good qualities and eliminate the undesirable characters of some of our very best varieties of cereals.

The Yields of Plants as Influenced by the Size of the Seeds Used.

The influence of the size of the seed of farm crops on the resulting crop is a question which has been discussed by practical farmers for ages past. Experimental work along this line, however, has been rather too complicated and expensive for individual farmers to carry out satisfactorily. It is more particularly a problem for the organized experiment stations to solve. As many of these stations, however, have not been established for many years, and as there are so many different questions which are forced upon the workers in these various institutions, the problem has not yet been solved in its entirety. As a step in this direction, however, some valuable work has been accomplished at our own institution in order to study one year's influence of the size of seeds on the yields of the resulting crops. In order to get as reliable results as possible, the different experiments have been repeated in each of a number of years by taking fresh seed from a general crop each spring. For the large sample, none but well developed seeds were selected; for the medium sized sample, the seeds selected were of a uniform character, plump, and of medium size; and for the small sample, none but sound, plump, and apparently good seeds of small size were used. The selections were made with great care by the use of sieves and then by hand-picking the seeds, so that the seeds of each selection would be very uniform and true to its particular selection. In the selection of large, plump grain, a sufficient quantity of each class to sow a plot twenty-five links square was carefully weighed out, after which the grains were counted. A corresponding number was then taken of the medium-sized seeds, and also of the small, plump seeds of oats, barley, spring wheat, winter wheat, and field peas. The different selections were sown upon plots of a similar size.

On making an examination of the detailed results, it was found that in forty separate tests made with seed grain of different sizes, the greatest yield of grain per acre was produced from the larger seeds in thirty-seven of the tests, from the smaller seed in two of the tests, and the yields were equal in one test.

The average results show that in every instance the largest seed produced the largest yield of grain. In no case did the smaller seed produce a greater yield of straw or a greater weight of grain per measured bushel than the seed of a larger size, but in three instances the results were similar. For a fuller statement of these results, the reader is referred to pages 86, 87, 88, and 89 of Part I. of the Annual Report of the Farmers' Institutes of the Province of Ontario for 1907.

The writer hopes to start other experiments in 1909 with the object of carrying out definite tests to ascertain the comparative value and the maximum yields produced from large numbers of seeds of different sizes, and from different thicknesses of planting. The results thus obtained would give an opportunity of comparing the maximum yields of the large and the small grains, and would also furnish other valuable information.

Continuous Selection of Seed Oats.

In 1893, an experiment was started by selecting seed from the general crop of the Joanette black oats of the previous year. The selection made in each of the following years was from the product of the selected seed of the year previous. The selections were large, plump, black seeds and light weighing and light colored seeds. The selections each year were composed of an equal number of grains, and were sown on uniform plots each twenty-five links square. Both yields per acre and the weights of grain per measured bushel are given for each of the years from 1894 to 1906 inclusive, and also for the average of each of the four year periods, which are as follows:

Years.	Weight per measured bushel (lbs.)			Yield of grain per acre (bushels).		
	Heavy plump seed.	Light seed.	Average annual difference.	Heavy plump seed.	Light seed.	Average annual difference.
1894	34.5	32.8		67.3	50.9	
1896	27.9	24.0	3.2	43.4	28.7	10.4
1897	34.8	32.4		53.4	49.3	
1898	35.9	31.3		80.1	73.7	
1899	39.1	35.1		55.2	50.3	
1900	37.4	31.0	6.0	100.2	91.4	15.8
1901	31.1	25.1		44.4	28.5	
1902	34.7	27.3		97.4	63.8	
1903	37.1	29.6		76.9	57.7	
1904	34.5	24.0	9.5	94.1	68.0	22.4
1905	35.5	24.3		65.5	44 7	
1906	31.5	23.0		62.7	39.3	

It will be seen that in every year the large, plump seed produced a greater yield and a heavier weight per measured bushel than the light seed, and that the differences between the two selections became greater as the number of years increased in which the selections were continued. The results of this experiment, later than 1906, will likely be published in future reports after they have been studied along somewhat different lines.

The Value of Sprouted Wheat for Seed Purposes.

Occasionally in Ontario the rains are so abundant at the time of harvesting the winter wheat crop that the grain becomes sprouted more or less in the shock, or even before it has been cut. As the crop dries, the germination

is checked and the grain hardens. It is often a question with farmers as to whether such grain, which has thus started to germinate, is as valuable for seed purposes as that which was cured under more favourable conditions. Rainy weather was quite general throughout Ontario during the winter wheat harvest of 1897 and again of 1902. In some parts of Ontario there was a considerable amount of rain during the winter wheat harvest of 1908, especially in the Niagara district, where the wheat ripened earlier than that grown farther north. In two different years, very careful germination tests were made at the College of wheat which was out during wet weather and which became more or less sprouted. A considerable number of varieties were used each year. The seeds were carefully counted and were planted in boxes and given an opportunity to germinate and to produce plants. For the one selection, seeds which showed no outward signs of having started to sprout were taken, and for the three other selections, seeds which had sprouted very slightly, considerably, and badly, were used. The folowing table gives the average percentage germination from each of the four selections in each of the two years:

Condition as to Sprouts.	Percentage of Germination.		
	Average First Year.	Average Second Year.	Average 2 Years.
Skin Unbroken	88	99	94
Skin Broken	66	85½	76
Considerably Sprouted	16	43½	30
Badly Sprouted	10	25½	18

It will be seen from the foregoing table that the sprouting of winter wheat in the field before it is harvested, injures the grain a great deal for seed purposes. When the grains are badly sprouted, not only do fully four-fifths of them decay in the ground, but even those which do grow produce plants which are very uneven in growth. As the results here summarized are the averages of a large number of tests, they should carry a considerable amount of weight.

Influence of Shrunken, Broken, and Immature Seed of Winter Wheat.

The results of twelve separate tests made at the College show an average increase in yield of grain per acre of 7.8 bushels from plump, as compared with shrunken seed, and of 35.6 bushels from sound as compared with broken seed. Seed which was allowed to become thoroughly ripened before it was cut, produced a greater yield of both grain and straw and a heavier weight of grain per measured bushel than that produced by wheat which was cut at any one of four earlier stages of maturity.

Influence of Shrunken and Broken Seed of Spring Grains.

In the average of six years' experiments which we have conducted, we have obtained an average increase in yield of grain per acre of 7.8 bushels from plump as compared with shrunken barley, and of 5 bushels from plump

as compared with shrunken spring wheat. In comparing sound grain with that which had been broken by the separator in threshing, the average yield obtained from the former surpassed that obtained from the latter by 10.6 bushels per acre in the experiments with barley for six years, and of 19 bushels per acre in the average of the experiments with peas for nine years. In these experiments, equal numbers of whole seeds and double the number of broken or half seeds were used. In all cases, the seeds were counted with great accuracy and were sown in plots twenty-five links square.

Treatment of Grain for Smut.

In order to study the result from treating seed oats and seed wheat for the prevention of smut, experiments have been conducted at the College for several years in succession. In each of five different years, two varieties of oats have received seven different treatments, and two varieties of winter wheat have received five different treatments. The various treatments used were as follows:

(1) *Immersion in Diluted Formalin.* The solution of formalin used for the immersion process was made by pouring one-half pint of the formalin into 21 gallons of water, and the seed oats were immersed in the solution for twenty minutes.

(2) *Sprinkling with Diluted Formalin.* One-half pint of formalin was poured into 5 gallons of water. The oats were then sprinkled with this solution and carefully stirred until the grain was thoroughly moistened.

(3) *Immersion in Hot Water.* For this treatment, the grain was placed in a bag, which was then immersed in water at about 115 degrees F. Soon afterwards it was placed in water which was kept at a temperature of between 130 degrees and 135 degrees F. The grain was occasionally stirred, and was allowed to remain in the water for a period of fifteen minutes. It was then spread out on a clean floor to dry, where it was stirred occasionally.

(4) *Immersion in Bluestone Solution for Twelve Hours.* In this treatment, the bluestone solution was made by dissolving one pound of bluestone in 25 gallons of water, and the oats were immersed in this solution for a period of twelve hours.

(5) *Immersion in Bluestone Solution for Five Minutes.* For this treatment, a strong solution was made by dissolving one pound of copper sulphate (bluestone) in one gallon of water, and then immersing the oats in the solution for a period of five minutes.

(6) *Immersion in Potassium Sulphide Solution.* The potassium sulphide treatment consisted of soaking the seed for two hours in a solution made by dissolving eight pounds of potassium sulphide in 50 gallons of water.

(7) *Sprinkling with Bluestone Solution.* This solution was made by disolving one pound of bluestone in 10 gallons of water, which was used for sprinkling over the oats until they were thoroughly moistened after being carefully stirred.

(8) *Untreated.* One sample of oats of each variety was left untreated in order that the influence of the various treatments might be observed.

After the treatments had been made for a few hours, the grains were carefully sown on separate plots, each of which was exactly twenty-five links long by twenty-five links wide. When the winter wheat was about ready to cut, it was carefully examined and the smutted heads were picked out and shelled. The rest of the crop was then threshed and again examined for

the smut balls. When the oats were coming into head, they were examined frequently and all smutted heads removed and carefully counted. The following table gives the average results in percentage of smutted grains of winter wheat, and of smutted heads of oats for five years during which each experiment was conducted.

TREATMENT.	Per cent. of Smut in Oats. Average of 5 Years.	Per cent. of Stinking Smut in Wheat. Average of 5 Years.
Immersion in Diluted formalin	.0	.0
Sprinkling with diluted formalin	.0	.0
Immersion in hot water	.0	.0
Immersion in bluestone solution for 12 hours	.1	.0
Immersion in bluestone solution for 5 minutes	.8	....
Immersion in potassium sulphide solution	1.2	....
Sprinkling with bluestone solution	1.3	.1
Untreated	5.7	4.2

In 1908, the winter wheat which was not treated had 6.8 per cent. of smut. That was the largest percentage of smut in any one year with the exception of 1905, when the untreated seed produced a crop of which over 9 per cent. was smut. Not only does the stinking smut in wheat reduce the yield per acre, but it greatly lessens the value of the wheat for flour production. The foregoing table shows that several treatments have been quite successful in preventing the development of stinking smut in wheat and of loose smut in oats, but some of them have proven to be slightly injurious to the seed to which they are applied. The results of all the experiments, however, show that the greatest yield of both winter wheat and oats per acre were produced from immersing seed in a solution made by adding one pint of formalin to 42 gallons of water, in which the grain was immersed for a period of twenty minutes. The treatment was easily applied, comparatively cheap, effectual in killing the smut spores, and also effectual in producing the largest average yield of both wheat and oats per acre of all the treatments used.

Differences in the Susceptibility of Varieties of Oats to Attacks of Smut.

It has been known for years past that oats could be successfully treated so as to kill the smut spores, and thus enable the seed to produce a greater yield of grain per acre. It has not been so clearly understood, however, that there was a marked variation in the different varieties of oats regarding the susceptibility to the attacks of smut. It seems quite evident from our experimental work at Guelph that varieties of both winter wheat and oats do not offer equal conditons for the growth and development of the smut. Some varieties certainly appear to be decidedly more susceptible than others to the attacks of this parasitic growth. During the years 1902, 1903, 1904, and 1905, we did not treat our varieties of oats for smut, but carefully picked out all smutted heads each year and kept an accurate record of the amounts of smut produced in the different varieties. In the spring of 1906, however, the varieties were all carefully treated by immersing the seed for twenty minutes in a solution made from one-half pint of formalin and 21

gallons of water. Since that time, the same varieties have not been again treated. The following table gives the number of smutted heads taken from a plot 10 links wide by 100 links long, from each of six different varieties of oats in each of the past seven years.

Variety.	Before Treatment.				After Treatment.		
	1902	1903	1904	1905	1906	1907	1908
Early Ripe	0	0	3	0	0	0	0
Joanette	20	9	10	18	0	2	12
Siberian	32	43	78	20	0	1	0
American Banner	116	303	317	22	0	3	2
Black Tartarian	332	608	369	62	0	3	12
Early Champion	634	380	1244	166	0	11	9

The results are certainly interesting and very suggestive. They show a wonderful difference in the comparative amount of smut produced by the different varieties of oats. They also show that the treatment in 1906 was very effectual in preventing the growth of smut in that year. It will also be seen that without further treatment the smut is again gradually increasing, but in the third year, after treatment, the smut is very much less than in any year before the treatment took place.

Another point which is brought out in the results presented, is the fact that the amount of smut varies considerably with the different seasons. It will be noticed that there was a greater amount of smut in 1904 than in either of the years 1903 or 1905.

The Early Ripe variety is the earliest oat amongst some two hundred and fifty varieties which we have grown in the experimental grounds, but the grain is long and slender, giving a light weight per measured bushel. It is quite probable, however, that this variety is entirely immune to the attacks of smut. It is true that there were three smut heads found in 1904, but when it is considered that fully 17,000 grains of oats are sown in each plot, it is quite likely that the three smutted heads were all from one plant, produced from a seed of some other variety, which, by means of manure, or in some other way, got into the plot. Taking advantage of the early maturity and of the apparent immunity to the attacks of smut, we have been using the Early Ripe variety to cross with the American Banner with the hope of securing a hybrid which will be early in maturing, immune to the attacks of smut, and at the same time will produce a large yield of grain of good quality. We have already a large number of hybrids produced from these two parents which are indeed interesting, and which are at present being very carefully studied and tested.

Quantity of Flax Seed Per Acre.

For four years in succession, each of four varieties of Flax has been sown, at the rate of one peck, two pecks, three pecks, eight pecks, twelve pecks,

and sixteen pecks per acre, making in all, twenty-four plots in the experiment each year. The following table gives the average results of this experiment, for a period of four years:

Amount of Seed Sown.	Weight per Measured Bushel.	Yield of Straw Per Acre.	Yield of Grain Per Acre.	Yield of Grain Per Acre less amount of Seed Sown.
	lbs.	tons.	bus.	bus.
1 Peck per Acre	54.9	1.38	15.0	14.8
2 Pecks " "	54.7	1.59	15.9	15.4
3 " " "	54.8	1.86	17.5	16.7
8 " " "	54.7	2.13	18.1	16.1
12 " " "	54.4	2.26	17.9	14.9
16 " " "	54.2	2.23	16.0	12.0

The highest average yield of Flax seed per acre was produced from eight pecks or two bushels of seed per acre. It will be seen, however, that the greatest yield of Flax seed, less the amount of seed used, was obtained by sowing three pecks of the seed per acre. It is generally understood that when seed production is the only object in view, a much thinner seeding is desirable than when the crop is intended for the production of fibre. Therefore when this experiment was commenced, it was expected that one of the first three seedings mentioned above would probably indicate the best quality of seed to sow per acre, for the production of seed, and that one of the largest seedings would give a similar indication regarding the sowing of Flax for fibre production. When Flax is sown quite thickly, the stems grow slender and upright, and do not branch, with the result that a much longer and better quality of fibre is produced, than when thinner sowing is resorted to. There was a marked difference in production, from the different varieties, as will be seen under the discussion of the varieties of Flax in another part of this report.

Seed Mixtures for Grain Production.

According to the Report of the Bureau of Industries for the Province of Ontario, we learn that there were 456,049 acres of mixed grains grown in 1908. Those counties having the greatest number of acres in mixed grains during the past season were as follows: Wellington, 41,437 acres; Huron, 24,756 acres; Waterloo, 22,044 acres; Simcoe, 20,590 acres; Ontario, 19,621 acres; and Grey, 19,275 acres. It will therefore be seen that mixed grains are grown quite extensively throughout Ontario.

Within the past nineteen years, a large amount of experimental work has been carried on at the College with the endeavor to glean reliable information regarding the different values of grain mixtures in comparison with the growing of the same grains separately, for the production of both grain and straw. Most of these experiments have been conducted for several years in succession, and the results which have already been obtained have exerted a considerable amount of influence throughout Ontario, in a general sowing of certain grains in definite proportions.

For five years in succession, an experiment was conducted in growing oats, barley, spring wheat, and peas separately and in eleven different combinations, having two, three, or four grains in each mixture. The results show that the grain which was sown in mixtures produced larger yields

per acre than the same kinds of grain sown separately, in from ninety to ninety-five per cent. of the tests. Of the eleven distinct mixtures used, the combination of oats and barley gave the highest average yield of threshed grain per acre. This mixture also gave a decidedly larger yield than any of the grains grown separately.

In 1902 and in each of the four years following, an experiment was conducted in duplicate in order to ascertain whether a seed mixture, composed of one bushel of oats and one and one-half bushels of barley per acre, could be improved by the addition of a small quantity of some other kind of seed. In addition to the mixture of oats and barley here mentioned, one-half bushel of flax, emmer, spring wheat and hulless barley were added, making in all five different combinations. The average results of the ten tests made in the five years showed that the greatest yield of grain per acre was produced by the use of oats and barley without the addition of any other kind of grain as included in this experiment.

Nine Mixtures of Barley and Oats Grown Together.

For six years in succession, an experiment was conducted at the College by using nine different porportions of oats and barley in order to determine which mixture and which quantity of seed would give the best results in the production of grain and straw. The lightest seeding used consisted of one-half bushel of oats and one-half bushel of barley, and the heaviest seeding of one and one-half bushels of oats and one and one-half bushels of barley per acre. The experiment was started in 1899 and finished in 1904. The average results show that the greatest number of pounds of grain per acre was produced from a mixture of one bushel of oats (34 lbs.) and one bushel of barley (48 lbs.), or a total amount of 82 pounds of mixed seed per acre.

In the spring of 1907, another experiment was started. This consisted in testing nine different proportions of oats and barley. A mixture of four pecks of oats and four pecks of barley, by weight per acre, was the only mixture which was similar in the two experiments. The experiment was conducted twice in 1907, first by using the Mandscheuri barley and the Daubeney oats, and second by using the Chevalier barley and the Siberian oats. In 1908, an experiment was conducted the same as in 1907, with the exception that the Two-rowed Canadian barley was used instead of the Chevalier barley in combination with the Siberian oats. The average results of the duplicate experiment for the two years are as follows:

MIXTURES. Quantities of Seed, per acre by weight.	Tons of Straw per acre.		Lbs. of Grain per acre.	
	1908	Average 2 Years 1907-08	1908	Average 2 Years 1907-08
3 pecks Oats, 3 pecks Barley	1.99	1.61	3114	2396
3 " " 4 " "	2.01	1.66	3077	2420
3 " " 5 " "	1.96	1.65	3162	2537
4 " " 3 " "	2.14	1.70	3136	2463
4 " " 4 " "	1.95	1.64	3153	2566
4 " " 5 " "	2.01	1.62	3207	2529
5 " " 3 " "	2.11	1.69	3288	2515
5 " " 4 " "	2.00	1.55	3333	2499
5 " " 5 " "	2.16	1.61	3294	2472

The highest yield of grain per acre was produced from the mixture of four pecks of oats and four pecks of barley in 1907, and from five pecks of oats and four pecks of barley in 1908. In the average of the two years, however, the greatest yield was produced from four pecks or 34 lbs. of oats, and four pecks or 48 lbs. of barley per acre. This is the identical combination which gave the highest yield of grain in a former experiment of a somewhat similar character, which was conducted in duplicate in each of six years. Another interesting feature of the experiment is the fact that both the lightest and the heaviest seedings gave comparatively low results in average yield of grain per acre.

The selection of varieties which will mature at about the same time is exceedingly important when it is desired to grow the grains in combination. A medium ripening variety of oats and a medium ripening variety of barley do not, as a rule, mix well together, owing to the fact that barley generally ripens several days earlier than oats. For this purpose, a very early variety of oats should be used with a six-rowed barley, such as, the Mandscheuri, or a very late variety of barley should be used with an ordinary maturing variety of oats, such as the Banner. In order to test the comparative values of leading varieties of oats and of barleys when grown in combination, an extensive experiment was conducted in 1907 and was repeated in duplicate in 1908. The following table gives the average results in yield of both straw and grain per acre for the two years:

MIXTURES. Quantities of seed per acre by weight.	Tons. of straw per acre.		Lbs. of grain per acre.	
	1908	Average 2 years 1907-08.	1908	Average 2 years 1907-08.
Black Hulless Barley, 60 lbs., Common Emmer 40 lbs	1.77	1.43	2695	2267
Guy Mayle Hulless Barley, 60 lbs., Siberian Oats, 34 lbs	1.71	1.67	2924	2614
Black Hulless Barley, 60 lbs., Siberian Oats, 34 lbs	1.92	1.60	2922	2389
Two-rowed Canadian Barley, 48 lbs., Banner Oats, 34 lbs	2.02	1.80	2801	2566
Two-rowed Canadian Barley, 48 lbs., Siberian Oats, 34 lbs	1.87	1.70	2663	2517
French Chevalier Barley, 48 lbs., Siberian Oats, 34 lbs	2.44	2.12	2819	2731
Mandscheuri Barley, 48 lbs., Daubeney Oats, 34 lbs	1.92	1.63	3278	2985
Mandscheuri Barley, 48 lbs., Alaska Oats, 34 lbs	1.93	1.77	3151	3021
Mandscheuri Barley, 48 lbs., Siberian Oats, 34 lbs	1.79	1.54	2937	2430
Mandscheuri Barley, 48 lbs., Banner Oats, 34 lbs	1.97	1.80	3149	2833
Mandscheuri Barley, 48 lbs., Joanette Oats, 34 lbs	2.03	1.82	2813	2725
Mandscheuri Barley, 48 lbs., Black Hulless Barley, 60 lbs	1.97	1.58	3321	2866
Mandscheuri Barley, 48 lbs., Guy Mayle Hulless Barley, 60 lbs	2.02	1.70	3338	2986
Mandscheuri Barley, 48 lbs., Dakota Mammoth Rye, 56 lbs	2.05	1.73	2909	2392
Mandscheuri Barley, 48 lbs., Common Emmer, 40 lbs	1.86	1.62	3290	2813
Mandscheuri Barley, 48 lbs., Wild Goose Spring Wheat, 60 lbs	2.12	1.73	2987	2561
Mandscheuri Barley, 48 lbs., Early Britain Peas, 60 lbs	1.77	1.53	2997	2755
Mandscheuri Barley, 48 lbs., Prussian Blue Peas, 60 lbs	2.00	1.70	2540	2324
Mandscheuri Barley, 48 lbs., Flax, 56 lbs	1.63	1.61	3364	3242

As a result of two years' experiments in testing nineteen different mixtures, it will be seen that the greatest average yield of grain per acre was produced by the Mandscheuri barley with a very early variety of oats, such as the Alaska or the Daubeney. The Mandscheuri barley and the Guy Mayle Hulless barley also gave a high yield of grain per acre. The Alaska and Daubeney varieties of early oats have been close rivals in their production of grain per acre when grown separately. Generally speaking, however, the Daubeney has surpassed the Alaska variety.

The percentage of each kind of grain produced from each variety in the various mixtures was carefully determined in the crop of the past year. The results show that barley in nearly all cases produces more than half of the crop. When one bushel by measure of each of the Mandscheuri barley and the Banner oats are sown together, the crop produced is about two-thirds its weight in barley and one-third in oats. In the case of the Two-rowed Canadian barley and the Siberian oats, the percentage of the two grains in the resulting crop is about equal. When Mandscheuri barley is mixed with the Prussian Blue peas, we find 88 per cent, of the former and only 12 per cent. of the latter in the crop produced. When Mandscheuri barley and flax are used in a combination, there is only 11 1/3 per cent. of the flax in the new crop. In no mixture did any kind of grain give as high a percentage in the crop produced as the Mandscheuri barley. After this experiment is conducted over a longer period, we hope to present more detailed results along the line of the percentages of the different kinds of grain in the crop when threshed.

Eight Kinds of Grain Grown in Combination.

For two years in succession, an experiment has been under way in which eight kinds of grain have been used in different combinations. One of the principal objects of this experiment has been to learn which of the eight kinds of grain will produce the greatest percentage of both straw and grain in the crop produced. The mixtures have been made up in two different ways: First, by using the same amount of seed of each variety as is usually sown when the grains are grown separately; and second, by using equal quantities of seed of all the varieties. Each of the mixtures here described was sown at the rate of 112 pounds of seed per acre. Both parts of the experiment were conducted in duplicate each year. The following table gives the average results of two tests in each of two years and shows the percentage of each grain in the crop produced from each of the methods of combination indicated above:

Varieties used in each mixture.	Percentage of Grains in Mixtures.						
	Uniform weights of seed sown 2 yrs. 4 tests.			Quantities of seed in same proportion as when grown separately. 2 yrs. 4 tests.			Average of two classes of mixtures 2 yrs. 8 tests.
	1907	1908	Average	1907	1908	Average	Average of two averages.
Six-rowed Barley (Mandscheuri). ..	24.4	30.4	27.4	23.8	27.5	25.7	26.6
Oats (Banner).....	15.8	21.3	18.5	11.5	13.6	12.5	15.5
Spring Wheat (Red Fife).....	17.3	7.7	12.5	16.5	8 8	12.6	12.5
Emmer (Common).....	12.8	7.9	10.3	14.8	10.6	12.7	11.5
Spring Rye (Dakota Mammoth)	10.6	9.5	10.1	9.8	8.1	9.0	9.6
Spring Wheat (Wild Goose).....	9.9	6.7	8.3	11.3	9.4	10.3	9.3
Hulless Barley (Guy Mayle)	4.9	10.6	7.7	5.3	11.4	8.3	8.0
Field Peas (Early Britain).....	4.5	5.9	5.2	7.3	10.6	8.9	7.0

It will be seen from both of these tests made in each of two years, that the Mandscheuri six-rowed barley, when mixed along with seven other kinds of grain, gave decidedly the largest percentage of the resulting crop. In fact, the average results show that the percentage of barley in the crop

produced was almost double that of any other kind of grain in the mixture. This certainly speaks well for the Mandscheuri barley in holding its own with all other competitors. It is a very heavy yielding variety whether sown in combination with other grains or when sown by itself.

It is interesting to compare these results with those of another experiment which was started in 1902 and conducted for six years in succession, in which twelve different kinds of grains were used in the manner described in the former experiment. The average results of the former experiment for the six years are as follows:

Varieties used in each mixture.	Percentage of grains in mixtures.	
	Uniform weights of seed sown. 6 yrs. 12 tests.	Quantities of seed in same proportion as when grown separately. 6 yrs. 12 tests.
Six-rowed Barley (Mandscheuri)	18.1	17.1
Spring Rye (Common)	13.3	14.1
Hulless Barley (Black)	12.5	14.2
Early White Oats (Alaska)	12.7	9.4
Black Oats (Joanette)	11.9	8.6
Emmer (Common)	7.0	7.9
Hulless Barley (White)	5.8	6.9
Peas (Field)	4.4	7.6
Spring Wheat (Wild Goose)	4.8	6.3
Grass Peas	5.6	4.7
Vetches (Common)	2.3	1.9
Flax (Common)	1.8	1.3

From an examination of the two tables, it will be seen that the Mandscheuri barley has given the highest percentage of grain in the crops grown from the different mixtures in every instance. The Banner oats have given higher percentages of grain, comparatively speaking, than either the Alaska or the Joanette varieties. The position of both the Spring Rye and the Hulless Barley varies somewhat in the two experiments. Emmer occupies a comparatively uniform position throughout, the average percentage of grain in comparison with the other classes being about the same in the ripened crop as it occupied in the seed before it was sown. All of these experiments go to confirm the results of other experiments and to show that it is difficult to make a mixture which will produce a heavier yield of grain per acre than one made by a combination of barley and oats.

Different Varieties of the Same Class of Grain Grown in Combination.

We have grown different varieties of winter wheat, of oats, and of barley separately and in combination, with the object of ascertaining whether or not there was any advantage in growing mixtures as against growing the varieties separately. The results of experiments conducted with winter wheat for five years and of barley and oats each for two years show that the mixtures have given very similar results to the averages of the varieties when grown separately. The results of our experimental work up to date, therefore, seem to strongly indicate that there may be a decided advantage from growing different classes of cereals together, but that there is no marked advantage by growing different varieties of the same class in combination.

Varieties of Six-rowed, Two-rowed and Hulless Barley.

During the past few years, the area devoted to the barley crop in Ontario has been increased by about twenty-five thousand acres annually. There is no grain crop in Ontario regarding which the area has increased so rapidly during the past eight or ten years as the barley crop. Not only has the area been greatly increased, but we find that the yield of threshed grain per acre has increased about twenty-five per cent. during the past ten years, as compared with the ten years previous. Although the two-rowed barleys are grown very extensively in England, in Germany, and in other European countries, the six-rowed varieties are used almost entirely in Ontario. They give a very large yield of grain per acre, as will be seen from the results presented in this and in other reports. A large number of different varieties obtained from various countries have been carefully tested in our experimental grounds. Practically all varieties are grown for at least five years in succession, after which period those kinds which produce poor results are discarded, and those which make satisfactory returns are retained for future experimental work. In this way the list is gradually changing by some of the varieties being dropped from the tests, while new varieties are added from time to time. There are but very few varieties in America which we have not had in our comparative tests.

Class and Varieties.	Bearded or Beardless.	Color of Grain.	Average Height (ins.)	Per cent of Rust.	Days to reach maturity.	Weight per measured bus. (lbs.)	Yield per acre.	
							Straw (tons).	Grain (bus.)
Six-rowed.								
Mandscheuri	Be.	White	39	3	105	51.2	2.21	74.7
California Brewing	Be.	White	33	8	105	46.3	2.08	73.3
Bonanza	Be.	White	40	2	105	51.3	1.71	68.4
Triumph	Be.	White	40	3	105	51.4	1.99	67.7
Oderbrucker	Be.	White	38	3	105	51.0	1.99	67.3
Common Six-rowed	Be.	White	38	3	104	52.0	1.93	65.6
Scotch Improved	Be.	White	36	3	106	51.4	1.93	63.1
Mensury	Be.	White	36	3	105	51.9	1.97	61.2
Black French	Be.	Black	32	7	103	49 8	1.54	58.8
Imperial Six rowed	Be.	White	36	3	104	52.1	1.82	57.0
Ohio Beardless	Ba.	White	39	3	102	46.1	1.88	49.9
Zero	Be.	White	38	5	118	50.6	2 74	49.8
Success	Ba.	White	36	2	97	47.4	1.57	48.7
Champion Beardless	Ba.	White	36	2	97	47.6	1.59	48.6
Dakota Silver Beardless	Ba.	White	38	3	101	46.2	1.82	48.1
Humboldt	Ba.	White	36	2	97	47.4	1.52	46.3
Two-rowed.								
Imported, No. 5591, Iowa	Be.	White	33	3	110	52.4	2.04	63.5
Hanna, No. 5590, Iowa	Be.	White	33	4	108	53.9	1.79	62.2
Jarman's Selected Beardless	Be.	White	34	4	108	53.4	2.10	61.0
Hanna Gerste	Be.	White	33	4	108	53.3	1 88	60.0
Two-rowed Canadian	Be.	White	36	5	110	53.1	2.13	55.6
New Zealand Chevalier	Be.	White	34	5	111	51.1	2.25	53.8
New Awnless	Be.	White	33	4	112	51.7	2.26	52.9
French Chevalier	Be.	White	33	4	111	51.2	2.14	52.6
Selected Canadian Thorpe	Be.	White	37	6	109	52.9	2.00	52.6
Duckbill	Be.	White	37	5	110	51.9	2.14	52.1
Hulless.								
Guy Mayle	Be.	Green	27	4	99	61.0	1.61	44.2
Purple	Be.	Purp'l	29	5	100	63.7	1.68	43.0
Black Hulless	Be.	Black	29	4	100	62.8	1.74	40.5
Hog	Be.	White	27	3	101	61.0	1.74	40.4
Winnipeg No. 2	Be.	White	27	3	102	60.5	1.71	40.3
Hungarian	Be.	White	32	4	105	59.6	1.63	38.7
New White Hulless	Ba.	White	31	6	106	59.9	1.87	31.4

The table gives the results of each of sixteen varieties of six-rowed barley, ten varieties of two-rowed barley, and seven varieties of hulless barley which have been grown in the experimental plots during the past five years:

The Mandscheuri variety of six-rowed barley, which we have already reported as giving such excellent results when grown in combination with oats, also stands at the head of the list of all the varieties of barley which have been tested at the College for each of the past five years. Although it is followed by the California Brewing by a difference of less than two bushels per acre, the last named variety is short in its growth, comparatively weak in the straw and possesses grain which is of a coarse character, and awns or beards which are exceedingly stiff. The Mandscheuri barley, however, is a variety having grain that is of excellent quality. The plants grow to a good height, the heads are of good size and well formed, the grain weighs well per measured bushel, and there is nearly always a very excellent yield of both grain and straw. It is interesting to compare the results of some of the lighter yielding varieties with that of the Mandscheuri. It will be seen that this variety surpasses the Common Six-rowed by fully 9 bushels per acre. This difference in yield applied to all the barley land in Ontario in 1908 would make an increase of over six million bushels of barley in the Province in the one year, an amount sufficient to maintain about twenty-five agricultural colleges similar to the one at Guelph.

It will be observed that each of the two-rowed barleys has produced grain which weighs on an average of over 51 pounds per measured bushel, the highest being the Hanna which weighs almost 54 pounds per measured bushel, or about six pounds above the standard weight of barley for Ontario. It was formerly thought that the two-rowed barleys produced rather longer straw than the six-rowed barleys. In the results here given, however, it will be seen that a number of the six-rowed barleys produced a greater length of straw than any of those having the two rows.

The hulless barleys are rather characteristic as possessing comparatively short straw, and having grain which has a standard weight of 60 pounds per measured bushel. The standard bushel of the hulless barley therefore weighs twelve pounds more than the standard weight for either the six-rowed or the two-rowed varieties. The Guy Mayle, which stands at the head of the list amongst the hulless barleys, is one that has made an excellent record in connection with the co-operative work throughout Ontario. In 1908, it gave a little over six bushels per acre more than the Black Hulless variety in the average of ten different experiments conducted in different parts of the Province. The Black Hulless is probably the best known of this class of barleys in Ontario. Not only does it give a less yield of grain per acre than the Guy Mayle variety, but it seems to be rather weaker in the straw, when grown in comparison with the former variety. It will be noticed that there are both six-rowed and hulless barleys which are black in the grain, and both six-rowed and hulless varieties which are beardless in the head. It will also be noticed that in every case the beardless barley has produced comparatively low results in yield of grain per acre.

Varieties of Winter Barley.

Although winter barley is scarcely known in the regular agriculture of Ontario, we have been doing something in testing a few varieties at the College for a number of years past. One variety we have grown for twelve years, and the average results for the twelve years are as follows: Weight, per measured bushel, 47.1 lbs.; yield of straw per acre, 1.2 tons; and yield

of grain per acre, 54 bushels. We have found by continually growing winter barley without change of seed that we have been enabled to increase the yield per acre about six bushels, as compared with imported seed in the average of experiments conducted for five years. In 1908, and also in 1907, the Tennessee variety of winter barley gave us decidedly the largest yield of grain per acre. Within the past fifteen years, the winter barley has been completely killed out on three occasions. It appears to be somewhat more tender than winter wheat, but when it survives the winter it usually gives very high yields of grain per acre.

Varieties of Oats.

The oat crop is the most important of all the cereal crops grown in Ontario at the present time. The area devoted to this crop reached 2,774,-259 acres, according to the latest report of the Bureau of Industries for the Province. This area is reported as yielding over ninety-six million bushels of grain.

As three hundred varieties of oats have been carefully tested at the Agricultural College, an opportunity has been afforded to ascertain something as to the productiveness and the characteristics of the various kinds of oats when grown under similar conditions. As over two hundred and fifty of these varieties have been grown in the Experimental department in each of five years or more, the records are very valuable. As sixty-one of these varieties have been under test during each of the past five years, the summary results are here presented as a basis of comparison and as a reference of varieties.

In the results of oats given in 1907, the Yellow Russian stood first and the Vick's American Banner second. With the yields of 1903 dropped off and those for 1908 included, the results of these two varieties have been slightly changed, and now we find the Vick's American Banner standing at the top of the list in yield of grain per acre. Those varieties which have produced an average yield of more than ninety bushels per acre are the Banner, the New Zealand, the Yellow Russian, and the Peerless. The yield of straw of the Scarboro variety of oats has been particularly high in each of the five years, the average for the whole period being 3.27 tons. This is the only variety which gave an average yield of straw of more than three tons per acre, although the American Banner very nearly reached that quantity. In weight per measured bushel, thirty-three of the varieties have gone beyond the standard weight for oats in Ontario. The heaviest weight per measured bushel of all the varieties grown at the College for the five year period was that produced by the Early Dawson, the weight being 38.4 pounds. The Daubeney variety of oats, which is one of the very best kinds of very early oats which we have grown at the College, has produced an average of a little over 88 bushels of grain per acre. The Daubeney produces a white grain which is of very good quality indeed, being quite thin in the hull. The Yellow Russian, which has made a very high stand in yield of grain per acre, was distributed throughout Ontario in the Spring of 1908 for co-operative experiments throughout the Province. In the average results of the experiments conducted on one hundred and fifteen farms throughout Ontario during the past year, the Yellow Russian gave an average of 46.4, the Irish Victor of 45, and the Daubeney of 43.1 bushels per acre. The Yellow Russian produced the largest amount of straw and was the most popular of these varieties amongst the experimenters. The Siberian is a variety of oats which has made a very good record at the College in past years, and has done very well indeed in many localities.

Varieties of Oats.	Average results for 5 years.						Yield per acre.	
	Heads mane or spreading.	Days to mature.	Height (ins.)	Per cent. rust.	Weight per measured bushel (lbs.)	Tons of straw per acre.	Bushels of Grain.	
							1908.	Average 5 years.
Vick's American Banner	Spreading.	111	50	14	33.9	2.95	83.5	93.8
New Zealand	"	111	49	12	32.2	2.59	85.5	93.3
Yellow Russian	"	111	48	11	32.5	2 66	79.1	92.9
Peerless	"	111	50	13	33.3	2.72	89.6	92.5
Irish Victor	"	111	50	14	33.6	2.36	83.4	89.2
Liberty	"	111	50	12	32.7	2.71	88.1	89.1
Daubeney	"	102	42	7	34.2	2.02	89.0	88.3
Siberian	"	108	48	12	33.2	2.36	82.7	88.0
Ertragreichster	"	112	48	12	32.8	2.50	78.8	87.7
Michigan Wonder	"	111	49	15	33.4	2.47	76.8	87.6
German Rust Proof	"	111	50	13	33.0	2.68	76.7	87.3
Imported No. 534 Iowa	"	108	46	9	33.9	2.27	78.1	86.9
New Golden Cluster	"	111	46	12	31.2	2.28	73.5	86.7
Waterloo	"	111	49	12	34.1	2.39	79.4	85.9
University No. 6	"	110	49	12	34.2	2.36	71.8	85.5
National	"	111	48	14	34.2	2.38	70.8	85.3
Newmarket	"	108	48	12	35.1	2.38	65.3	85.0
Alaska	"	101	44	6	34.5	1.96	74.7	84.7
Imported No. 545 Iowa	"	108	45	9	34.3	2.15	70.8	84.5
Ligowa Hafer	"	109	47	13	35.4	2.43	70.6	84.5
Oderbrucker	"	111	48	12	34.5	2.44	85.8	84.1
Prince Royal	"	109	47	16	34.3	2.22	73.9	83.4
Canadian Pride	"	108	47	11	33.0	2.20	77.8	83.2
Abundance	"	109	48	11	34.8	2.42	66.2	83.0
Rennie's White Irish	"	109	47	12	35.1	2.41	67 7	82.9
Joanette	"	109	40	6	34.2	2.86	71.7	82.4
Bavarian	"	111	49	10	34.2	2.75	74.1	82.3
White Marvel	"	110	49	13	34.5	2.31	77.5	82.3
Golden Beauty	"	111	48	13	34.0	2.40	66.9	82.1
Improved Ligowa	"	108	47	12	35.4	2.34	66.4	82.0
Waverley	"	112	49	14	34.4	2.51	77.0	81.5
Probsteier	"	110	47	11	35.2	2.30	83.4	81.1
Swedish Wisconsin No. 4	"	108	48	13	34.1	2.20	64.8	80.8
Potato	"	109	46	13	35.5	2.32	71.3	80.0
New Sensation	"	109	45	11	35.2	2.33	65.1	79.9
Twentieth Century	"	108	46	14	34.3	2.17	57.7	79.8
Black Tartarian	Mane.	113	48	13	31.0	2.62	80.4	79.6
Scarboro	"	117	49	12	31.7	3.27	85.5	79.4
Black Anthony	"	111	48	13	31.0	2 96	80.6	79.2
Black Beauty	Spreading.	105	43	14	34.3	2.51	80.7	78.5
Canadian King	Mane.	109	48	14	33.5	2.56	63.2	78.0
Sheffield Standard	Spreading.	110	47	14	34.7	2.20	64.4	77.7
Early Champion	"	104	45	8	34.2	2.04	76.5	76.8
Storm King	Mane.	109	47	12	32.7	2.56	62.3	76.5
Early Ripe	Spreading.	98	41	6	28.0	2.07	70.3	76.5
Tobolsh	"	108	47	14	35.9	2.34	70.4	76.2
English Wonder	"	105	47	12	30.8	2.24	79.2	76.2
Early White Pearl	"	107	46	12	33.1	2.34	73.3	76.0
Egyptian	Mane.	110	48	12	36.8	2.80	61.8	75.7
Sunshine	"	116	47	14	29.2	2.76	77.9	75.5
Besler's Hafer	Spreading.	113	54	15	34.0	2.91	74.9	75.2
Prosperity	"	100	42	7	34.2	2.25	78.9	75.1
Goldfinder	"	115	46	17	30.7	2.53	71.2	73.2
Black Diamond	"	107	44	10	29.5	2.50	60.5	72.2
Tartar King	Mane.	108	48	14	34.8	2.31	60.6	70.4
Black Mesdag	Spreading.	99	46	12	30.8	2.26	65.8	70.4
Pioneer	"	107	42	16	34.3	2.55	62.4	69.6
Zhelannie	"	104	49	14	36.5	2.65	62.3	66.0
Early Dawson	"	104	49	13	38.4	2.79	60.6	62.7
White Superior Scotch	"	104	49	13	37.9	2.49	58.0	60.0
Hulless Oats	"	107	50	9	.....	2.95	42.1	47.9

A Comparison of the Strength of Straw of a Few Varieties of Oats.

During the past few years, farmers have had a great deal of trouble on account of their oat crop becoming badly lodged before it was harvested. We take careful notes of the percentage of each crop which lodges in each year of the general experiments with the oats. During the last two years, however, a special experiment has been conducted by growing eight varieties of oats in duplicate on low land, in order to study very carefully the strength of the straw under rather severe conditions. The following table gives the percentage of crop lodged three weeks before ripening, and also at the time of ripening of each variety of oats in 1908, and also in the average of two years' experiments.

Varieties.	Percentage lodged three weeks before ripening.	Average 2 years.	Percentage lodged when ripe.	Average 2 years.
	1908.		1908.	
Siberian	15	10	77	49
Golden Beauty	12	9	73	67
Liberty	1	1	25	16
Sheffield Standard	15	10	90	75
Banner	2	2	53	31
Tartar King	1	1	89	77
Daubeney	55	28	94	51
Early Champion	23	13	92	56

These results present some interesting data. It will be seen that the Liberty variety of oats possessed the stiffest straw of all the varieties included in this special test. The American Banner also made a very good showing in this respect. One of the peculiar facts in reference to this experiment is that shown in the results of the Tartar King. This variety usually stands up splendidly during the earlier part of the season. On low land, however, the straw seems to become very brittle and lodges badly. Not only does this variety show the largest average amount of lodged grain, but owing to the peculiar character of the straw, it frequently bends at right angles or nearly so, and thus tends to check the flow of sap and makes the harvesting a very difficult matter. The Sheffield Standard, we find, lodges very badly both in our special and in our general experiments.

The average yields per acre of these eight varieties of oats on the low land were as follows: Liberty, 77.6 bushels; Banner, 73.4 bushels; Daubeney, 73.1 bushels; Golden Beauty, 64.1 bushels; Tartar King, 63.4 bushels; Sheffield Standard, 61.9 bushels; Early Champion, 60.3 bushels; and Siberian, 59.9 bushels.

Classification of Wheat.

There are a number of distinct types or species of wheat grown in Ontario. A study of the different classes of wheat is very interesting and instructive, as the different classes possess different characteristics. As several authorities divide cultivated wheat into seven distinct species, we here place the classification, and would suggest that if the reader would follow up the study of this classification he would undoubtedly be well repaid for his trouble. The species may be enumerated as follows:

(1) Common, fine, or soft wheat (*Triticum vulgare*).
(2) Turgid, or toulard wheat (*T. turgidum*).
(3) Hard, or flinty wheat (*T. durum*).
(4) Polish wheat (*T. polonicum*).
(5) Spelt (*T. spelta*).
(6) Emmer, or starch wheat (*T. dicoccum*).
(7) One-grained wheat (*T. monococcum*).

The greater number of the wheats of both the winter and the spring varieties which we grow in Ontario belong to the first class, and are used very largely for the production of flour.

Varieties of Winter Wheat for Flour Production.

About two hundred and sixty varieties of Winter Wheat have been grown at the Agricultural College within the past nineteen years. All varieties are carefully tested for a period of five years, after which the inferior kinds are dropped and the most promising sorts are continued in future tests. In 1908, sixty-five varieties were under experiment. Of this number, ten varieties have been grown for less than five years and fifty-five varieties for five years or over. As each of fifteen of the varieties has been grown for at least thirteen years, the average results of these are particularly interesting and valuable. The following table gives, for each of these fifteen varieties, the average weight per measured bushel for twelve years, the yield of grain per acre for 1908, and the average yield of both straw and grain per acre for the thirteen-year period:—

Variety.	Color of Grain.	Pounds per measured bushel 12 years.	Yield per acre.		
			Bushels grain 1908	Average 13 years.	
				Tons straw.	Bushels grain.
Dawson's Golden Chaff	White	60.0	43.9	3.3	55.4
Imperial Amber	Red	60.9	32.1	3.6	51.2
Early Genesee Giant	White	60.1	31.1	3.3	50.4
Russian Amber	Red	61.2	30.6	3.5	49.8
Egyptian Amber	Red	61.5	30.9	3.5	49.4
Early Red Clawson	Red	59.2	29.8	3.1	49.3
Rudy	Red	61.1	37.6	2.9	47.1
Tasmania Red	Red	61.8	28.5	3.2	46.3
Geneva	Red	62.5	35.4	3.2	46.0
Tuscan Island	Red	61.0	32.1	3.1	45.7
Turkey Red	Red	61.5	35.4	2.9	45 5
Kentucky Giant	Red	61.4	35.3	3.0	45.1
Bulgarian	White	60.8	24.3	3.0	45.0
Treadwell	White	60.7	26.9	3.0	44.8
McPherson	Red	62.0	24.9	2.9	43.8

The average results of the fifteen varieties are as follows: Weight per measured bushel, 62.8 lbs. for 1908, and 61 lbs. for the thirteen-year period; and yield of grain per acre, 31.9 bus. for 1908, and 47.7 bus. for the thirteen-year period. It will therefore be seen that in the experiments at the College in 1908, the winter wheat gave a comparatively light yield of grain, but that the grain was of superior quality.

The Dawson's Golden Chaff stands the highest in average yield of grain per acre of the fifteen varieties tested in each of thirteen years. It produces a very stiff straw of medium length, beardless heads with red chaff, and white grain somewhat soft but about the standard in weight per measured bushel. The Imperial Amber produces a large amount of straw which is rather weak, a bearded head with red chaff, and a red grain of average quality. The Early Genesee Giant furnishes a straw of medium length and of fair strength, a short, compact, bearded head, and a grain which is sometimes classed as white and sometimes as amber. The straw of the Tasmania Red, Geneva, Tuscan Island, Turkey Red, and Kentucky Giant is comparatively weak, but the grain is hard and weighs well per measured bushel.

Fifty-five varieties of winter wheat, grown in 1908, have been under experiment for at least five years. In the five years' test, the highest average yields of grain per acre have been produced by the Dawson's Golden Chaff (48.5 bus.), and seven other varieties which resemble it very closely and which yielded as follows: American Wonder, 51 bus.; New American Banner, 50.9 bus.; Abundance, 50.6 bus.; Beardless Rural New Yorker No. 6, 50.4 bus.; Prize Taker, 47.4 bus.; Superlative, 47.1 bus.; and Forty-fold, 46.6 bus. The highest average yields, produced by varieties of other types in the five years' experiment, are as follows: Genesee Reliable, 45.7 bus.; Paramount, 44.7 bus.; Egyptian Amber, 44.5 bus.; and Imperial Amber, 44.3 bus.

The heaviest weights of grain per measured bushel in the five years' test have been produced by the Northwester, 62.3 lbs.; Geneva, 62.1 lbs.; Kentucky Giant, 62 lbs.; Auburn, 61.9 lbs., and Genesee Reliable, 61.9 lbs.

Of the sixty-five varieties of winter wheat, grown in 1908, the greatest yields of grain per acre were produced by the American Banner, 47.5 bus; Beardless Rural New Yorker No. 6, 45.5 bus.; Dawson's Golden Chaff, 43.9 bus.; American Wonder, 42.8 bus.; Prize Taker, 39.5 bus.; and Genesee Reliable, 37.9 bus., and the heaviest weights per measured bushel by the Geneva, 64.4 lbs.; Egyptian Amber, 64 lbs.; Russian Amber, 64 lbs.; Genesee Reliable, 63.9 lbs.; Turkey Red, 63.9 lbs.; and Banatka, 63.9 lbs.

In 1906 and in 1907, fifty-seven varieties of winter wheat grown in the Experimental department were tested for bread production in the bakery branch of the Chemical department of the College. Those varieties of wheat which produced the largest loaves of bread from equal quantities of flour in the average of two years' experiments are as follows: Crimean, Red, Yareslaf, Winter Red Fife, Banatka, Northwester, Turkey Red, McGarvin, Geneva, Rudy, and Tasmania Red. These varieties all possess red grain, and with two exceptions, bearded heads.

From the various varieties of wheats tested at the College, it seems to be generally true that white wheats yield more grain per acre, possess stronger straw, weigh a little less per measured bushel, are slightly softer in the grain, produce a more popular pastry flour, and furnish a somewhat weaker flour for bread production than the red varieties.

Varieties of Spring Wheat for Flour Production.

Although there is not nearly as much interest taken in the cultivation of spring wheat in Ontario as there was several years ago, still we find that in 1908, 142,124 acres were devoted to this crop. Not only have we had under experiment the different varieties obtainable in Ontario, but we have imported other kinds from various countries of the world and have tested them under similar conditions with those which we have grown in this Pro-

vince. As the tabulated results in a summary form for the spring wheats have not been placed in our report for some time, we are here presenting in a concise form the summary of our work with the different varieties of this class of spring wheat for the past five years.

Varieties.	Bearded or Beardless.	Color of Grain.	Average Height (ins.)	Per cent. of Rust.	Days to reach maturity.	Weight per measured bus. (lbs.)	Yield per acre.	
							Straw (tons).	Grain. ((bus.)
Minnesota No. 163	Ba.	Red.	46	6	121	58.9	2.15	34.1
Hungarian	Be.	Red.	41	5	116	62.1	2.05	33.5
Climax	Be.	Red.	47	6	119	59.1	2.14	31.9
Carleton	Be.	Red.	47	9	120	59.3	2.16	31.4
Red Fife	Ba.	Red.	45	8	120	58.2	2.05	31.3
Saxonka	Be.	Red.	46	6	119	59.8	1.96	31.2
White Russian	Ba.	Red.	43	9	121	58.0	1.91	31.0
Blue Democrat	Be.	Red.	46	9	119	58.9	2.07	30.8
Preston	Be.	Red.	43	10	115	59.1	1.82	30.8
Wellman Fife	Ba.	Red.	45	11	120	57.5	2.06	30.5
Kolben	Ba.	Red.	44	7	121	59.2	1.97	30.1
Herison Bearded	Be.	Red.	43	7	118	61.8	1.94	30.1
Pringle's Champion	Be.	Red.	46	8	119	58.1	2.10	29.7
Red Fern	Be.	Red.	46	8	119	29.3	1.93	29.6
Early Wonder	Ba.	Red.	46	5	123	57.8	2.11	29.5
Perron Red	Ba.	Red.	45	8	120	57.8	2.02	28.7
Minnesota No. 169	Ba.	Red.	45	6	123	58.4	1.88	28.6
Chubut	Ba.	Red.	41	19	115	60.5	1.91	27.1
Colorado	Be.	Red.	45	9	115	59.0	1.92	27.1
French	Be & Ba.	Red.	45	16	118	59.4	2.14	26.9
Perron White	Ba.	White	45	11	117	56.0	1.82	26.3

The Minnesota No. 163, which occupied the highest place in yield of grain per acre, is a special selection made at the Minnesota Experiment Station a few years ago under the guidance of Prof. W. M. Hays, who is now Assistant Secretary of Agriculture for the United States. Unfortunately, however, this variety has given a rather light weight per measured bushel, the average for five years being only 58.9 pounds, while that of the next following variety in the list is 62.1 pounds. I wish to draw particular attention to the wheat under the name of Hungarian, which now stands second in the list in yield of grain per acre. Not only does it give a very large yield, but the grain weighs on an average of 62.1 pounds per measured bushel, which is exceptionally high for spring wheat in Ontario. Although no baking tests have yet been made with this variety, the grain appears to be of good quality. The variety was imported from the Argentine Republic a few years ago through the kindness of one of our students who arranged to have this variety sent to us in order that we might test it in Canada, as it had been giving such good results in the Argentine Republic. We distributed this variety of wheat throughout Ontario in 1908 for the first time, and the average results of experiments conducted on fifteen different farms show that it gave a little larger yield of both straw and grain per acre, and was somewhat more popular with the experimenters than the Red Fife variety, which is well known throughout the Province, and is considered one of the very best varieties of spring wheats in Canada. It will be seen that the Hungarian variety has given a yield of about 2¼ bushels per acre more than the Red Fife in the average of five years' experiments at the College.

Varieties of Spring Wheat for the Production of Macaroni.

The varieties of wheat used for the manufacture of macaroni belong principally to the third species mentioned in the foregoing classification. Of this class of wheats, six varieties have been grown for sixteen years in succession. The following table gives the average results of seven varieties which we have had under careful test in each of the past five years:—

Varieties.	Bearded or beardl's	Average height (ins.)	Per cent. of rust.	Days to reach maturity.	Weight per measured bushel (lbs.)	Yield per acre.	
						Straw (tons).	Grain (bus.)
Wild Goose	Be	45	3	121	63.0	1.89	36.7
Kubanka	"	45	4	120	62.2	2.11	36.3
Medeah	"	44	5	116	61.3	1.76	32.9
Sorentina	"	45	6	118	60.2	1.92	32.1
Bart Tremenia	"	41	4	119	61.4	1.78	32.1
Algiers	"	42	6	118	57.5	1.74	31.4
Ontario	"	51	9	130	56.4	2.26	25.3

The Wild Goose variety, which stands at the head of the list in yield per acre, is now grown over Ontario quite extensively, there probably being more acres devoted to this variety than to all other varieties of spring wheat combined. The Wild Goose wheat has been distributed throughout Ontario for a considerable number of years through the medium of the Experimental Union, and it has given large yields of grain throughout the Province. The Kubanka wheat is a variety belonging to the same class, and is giving excellent results in some of the semi-arid regions in the central western part of the United States. It has also made a very good record indeed in our own experiments at the College. The Roumania variety of wheat, which was furnished to us through the kindness of Dr. C. E. Saunders, of the Central Experimental Farm, at Ottawa, in the spring of 1907, has given us very good results in each of the past two years, producing a yield of 36.9 bushels per acre in 1907, and of 36.0 bushels per acre in 1908. A variety, known as the Iumillo, has become quite noted in certain parts of the United States for its great resistance to disease, surviving while practically all the others have succumbed to rust, etc., under severe climatic conditions. This variety gave a yield per acre of 29 bushels in 1906, 33 bushels in 1907, and 27 bushels in 1908. It has, therefore, given somewhat lower results than the Wild Goose variety in the yields of the past three years.

Varieties of Spring Wheat for Feeding Purposes.

When emmer was introduced in Ontario a few years ago under the name of spelt, we heard all sorts of comments regarding this grain. From the classification of wheat previously referred to, it will be seen that emmer and spelt are two distinct types. Each of these types or species of grain contains a number of varieties. They are used for grinding into meal for feeding to farm stock, owing to the fact that the chaff adheres to the grain

and is not removed in the process of threshing. The following table gives the average results of three varieties of emmer and of four varieties of spelt for a period of seven years:—

Classes of crop.	Varieties.	Average result for 7 years.			Pounds per measured bushel average of 6 years.	Aver. result for 7 yrs.	
		Per cent of rust.	Per cent of crop lodged.	Per cent of hull.		Tons of straw per acre.	Pounds of grain per acre.
Emmer	Common	3	29	22	39.2	2.2	3,145
	Iowa	2	22	21	40.0	2.0	2,910
	Russian	2	25	21	40.1	2.0	2,884
Spelt	Red	13	3	30	28.0	1.8	2,271
	Alstroum	18	4	30	28.2	1.8	2,282
	White	14	3	32	28.1	1.7	2,003
	Dasyanthum	15	11	29	28.3	1.7	1,869

The great superiority of the emmer over the spelt as a grain producer in Ontario is very clearly seen by the accompanying results. Not only does this prove true in our own experiments at the College, but it has also been quite manifest in the co-operative experiments throughout Ontario during the past few years. In practically all tests which have been made, the emmer yields decidedly heavier than the spelt. It will also be noticed that the emmer is much thinner in the hull than the spelt. There is a marked difference in the character of the straw of the two classes of grain, the straw of the emmer being very free from rust but somewhat inclined to lodge, while that of the spelt is comparatively stiff in character but is very subject to the attacks of the rust. The three varieties of emmer show an average variation of 261 pounds of grain per acre, and the four varieties of spelt a variation of 402 pounds of grain per acre. From feeding experiments conducted in some of the experiment stations in the United States, emmer has produced results not very much different from those obtained from barley.

Polish Wheat, Corn Wheat, or Colorado Giant Rye.

This grain has been sold under various names during recent years and received a good deal of sensational advertising in the newspapers, under the name of Corn Wheat, about five years ago. It is an old wheat and has been grown to a limited extent in many countries, under the name of Polish Wheat (Triticum polonicum). We have now grown the Polish Wheat for fifteen years in our experimental grounds, and the results have been comparatively low. In no one year has the yield per acre of the Polish Wheat surpassed that of the Wild Goose variety. In 1908, the Polish variety gave a yield of 23.8 bushels per acre, and a weight per measured bushel of 56.3 pounds. Although this wheat has been advertised for sale in Ontario at the rate of $7.00 per bushel, it will not likely be grown in this Province except as a sort of curiosity. As the heads are very large, the chaff prominent, and the grain very long, it is an interesting variety to have in a collection.

Turgid or Toulard Wheat (Alaska).

The Turgid wheat is mostly grown in central Europe, although this class of wheat has been grown in England under various names; such as, Rivets, Duckbill, Grey Pollard, etc. The grain is large and plump and

possesses a peculiar hunch on the back of each kernel. The varieties of this class which we have grown the most extensively at the Agricultural College are the Miracle winter wheat and the Seven Headed spring wheat.

The Miracle has a peculiar branching head of good size. This variety was grown at the Ontario Agricultural College previous to 1893. As it gave comparatively poor results, however, it was dropped at that time. It produced 20.6 bushels of grain per acre in 1891, and 27.7 bushels per acre in 1892.

The Seven Headed variety of wheat also possesses a branching head. It has been grown as a spring wheat at the Ontario Agricultural College each year since 1896. The following table gives the yield per acre of the Seven Headed wheat in comparison with the Wild Goose and the Red Fife varieties of spring wheat, in each of the years, from 1896 to 1908, inclusive:—

Year.	Red Fife.	Wild Goose.	Seven Headed.
1896	15.7	20.4	2.5
1897	20.7	23.1	6.5
1898	34.2	48.3	24.7
1899	39.2	44.5	26.4
1900	46.3	48.4	39.4
1901	24.1	32.1	22.2
1902	31.9	33.5	25.0
1903	43.5	47.1	34.3
1904	22.2	47.1	33.2
1905	35.9	41.5	30.8
1906	33.9	36.0	28 2
1907	28.0	33.2	19.1
1908	36.3	25.6	24.5

The average yield per acre for each variety for the thirteen years was as follows: Red Fife, 31.7 bushels; Wild Goose, 37 bushels; and Seven Headed, 24.4 bushels.

The Alaska wheat, regarding which such extravagant claims have been made by means of private advertising and through the public press of the United States and of Canada during the past few months, evidently belongs to this class of wheat, and is very similar indeed to the Seven Headed variety. In order to obtain as full information as possible regarding the Alaska wheat, the writer communicated with the agricultural colleges in the States of Idaho and Washington and also with the originators and producers of the Alaska wheat. The Professor of Agronomy at the Idaho Agricultural College wrote, under date of August 27th, 1908, that he saw no reason for doubting that the Alaska is the ordinary Miracle or Egyptian wheat (*Triticum turgidum*), of which Eldorado and Seven Headed are two of the varieties. He also stated that the very best fields of Alaska wheat in Idaho in 1908, did not exceed 35 bushels to the acre, and that others gave considerably less than this amount. The Director of the Agricultural Experiment Station of the State of Washington wrote on August 26th, 1908 as follows:

"I will say that the wheat in question is undoubtedly the same thing as the old Miracle or Seven Headed wheat."

The writer wrote to the promoters of the Alaska wheat with the hope of securing some of the seed for sowing in the experimental grounds at the College, but was unable to purchase a small quantity for experimental purposes. The crop of 1908 was advertised at $20.00 per bushel. The wheat

certainly resembles very closely indeed the Seven Headed variety, which we have grown at the College for many years with comparativley poor results.

Farmers who pay high prices for the so-called new varieties of farm crops before the experimental stations thoroughly investigate the matter have themselves to blame. The writer believes that there are not many farmers in Ontario who are led astray by the sensational advertising of farm crops with the object of enriching the promoters of these new and wonderful varieties. The Government of Ontario is doing much to protect the farmers by its extensive system of experimental work conducted at the Ontario Agricultural College and through the medium of the Experimental Union.

Varieties of Winter Rye.

Four varieties of winter rye have been grown in the Experimental department in each of the past five years, and the following are the average results in yield of grain per acre and in weight of grain per measured bushel: Mammoth White, 63.3 bus.; 57.8 lbs.: Washington, 59.5 bus.; 58.1 lbs.: Common, 55.2 bus.; 57.0 lbs.: and Thousand Fold, 54.3 bus.; 57.5 lbs.

Varieties of Spring Rye.

Four varieties of spring rye were under test in 1908, giving yields per acre as follows: Saatroggen, 23.8 bushels; Prolific Spring, 19.2 bushels; Dakota Mammoth, 18.1 bushels; and Common, 18 bushels per acre. Each of these varieties has been grown for five years in succession, the greatest yield being produced by the Saatroggen with 30 bushels, and the second greatest yield by the Dakota Mammoth with 28.7 bushels per acre. The Saatroggen gave a yield of 36.5 bushels per acre in 1907, which is the highest yield obtained from any of the varieties during the past five years. From one selected strain of the Saatroggen variety, however, which we have had under experiment for the last three years, we have obtained very excellent results, the yields being as follows: 1906, 35.6 bus.; 1907, 37.8 bus.; and 1908, 27.4 bus. per acre. These yields surpassed all the others in each of these years. This selected strain of the Saatroggen variety of spring rye is certainly very promising.

Varieties of Buckwheat.

We here present the average of four years' results in growing each of five varieties of buckwheat in the Experimental department, which are as follows:

Varieties.	Lbs. per measured bushel.	Tons of straw per acre.	Bushels of grain per acre.
Rye Buckwheat.....	53.0	2.3	32.7
Silver Hull.....	51.7	2.5	23.5
Common Grey.....	46.5	2.8	21.5
New Calcutta.....	50.9	2.4	20.7
Japanese.....	45.2	2.3	17.5

The Rye buckwheat, which stands the highest in yield of grain per acre, has been grown for only a few years at the College, but it is by no means a new variety. It is the Rye buckwheat which is grown extensively

in Nova Scotia. It is sometimes called Sand, Notched, or Rough buckwheat. One of the difficulties which we have observed in growing this buckwheat in Ontario is the fact that the crop seems to ripen more unevenly than that of the other varieties. At the same time that some of the seed is ripened other seed is still quite green, and in fact blossoms can be found on the outer end of the branches. The Japanese buckwheat has given comparatively poor results during the past few years. It seems to thrive best when the season is comparatively warm and dry.

Three varieties of buckwheat have now been grown in the Experimental department in each of eleven years, the following being the average yield of grain per acre per annum: Silver Hull, 19.8 bus.; Japanese, 19.6 bus.; and Common Grey, 18 bus. In 1908, the Rye buckwheat produced decidedly the largest results of grain per acre in the comparative tests.

Varieties of Field Peas.

Twenty-seven varieties of field peas were grown at the College in 1908. Owing to the ravages of the pea weevil in South Western Ontario for a period of several years, no experimental work was conducted with this crop in our experimental grounds. This was due largely to the fact that many farmers had stopped growing peas entirely, and it was thought that with a united effort the pea weevil might be exterminated to a considerable extent. As the weevil has largely disappeared, the cultivation of the crop is again increasing throughout the Province. In the results of the experiments with the twenty-seven varieties of peas grown at the College in 1908, we find that the greatest yields were produced by the Early Britain, 39.1 bus.; Potter, 34.1 bus.; New Canadian Beauty, 33.6 bus.; and Black Eyed Marrowfat, 33.5 bus. These were the only varieties which gave a yield of more than thirty bushels per acre.

Eight varieties of peas have been grown at the College in each of nine years. As these varieties include some of the common kinds, such as, the Golden Vine and the Multipliers, and some of the newer introductions, such as, the Early Britain and the New Canadian Beauty, we present the average results of the experiment which was conducted in each of nine years.

Varieties.	Days to mature. Average of 12 years.	Length of vines. Average of 7 years.	Average results for 9 years.		
			Weight per measured bushel.	Tons of straw per acre.	Bushels of grain per acre.
		ins.	lbs.		
Early Britain	102	40	57.3	1.37	38.3
Potter	103	46	59.6	1.44	35.1
New Canadian Beauty	105	49	60.5	1.42	32.5
White Eyed Marrowfat	105	44	60.6	1.53	31.8
Black Eyed Marrowfat	106	44	59.7	1.37	30.1
Prussian Blue	107	49	60.0	1.60	29.7
Multipliers	109	51	60.5	1.75	28.5
Golden Vine	105	43	60.1	1.41	28.3

It will be seen that the Early Britain, which gave the highest yield of twenty-seven varieties of field peas grown at the College in 1908, has also given the highest yield per acre in the average of nine years' experiments with each of eight varieties. It will also be observed that the Potter variety

stands second both for 1908 and for the average of nine years. The Golden Vine, which is a small white pea, has been grown throughout Ontario extensively and is possibly the best known of all the varieties on the list. It is the common small white pea of Ontario. In the average results for the nine years, however, it occupies the lowest place in yield of grain per acre.

Varieties of Field Beans.

Fourteen varieties of field beans were under experiment at the College in 1908, and the results show that the greatest yields per acre were produced from the Burlingame Medium, New Prize Winner, Pearce's Improved Tree, Small White Field, Red Kidney, and Yellow Eyed Marrowfat varieties. Besides the fourteen varieties, five selected strains of four of the varieties were grown under similar conditions to those used for the variety test. It was found that a selection of the New Prize Winner gave a greater yield per acre than any of the varieties referred to.

As eleven of these varieties have been grown in each of ten years, the average results are very valuable and are presented as follows:

Varieties.	Average results for 10 years.	
	Weight per measured bushels. (lbs.)	Grain per acre. (bushels.)
Pearce's Improved Tree	64.9	24.0
Burlingame Medium	64.6	22.5
White Wonder	64.7	22.1
Medium or Navy	64.8	21.5
Schofield Pea	65.1	21.4
Day's Improved Leafless	65.0	21.0
Buckbee's Electric Tree	65 0	20.0
Marrowfat	64.4	19.7
Boston Pea	65.0	19.0
Small White Field	64 1	18.2
Large White Haricots	58.0	15.9

In the average of ten years' results of each of eleven varieties of field beans, it will be seen that the Pearce's Improved Tree gave the greatest yield with 24 bushels per acre, which was followed by the Burlingame Medium with 22.5 bushels and the White Wonder with 22.1 bushels per acre. In weight per measured bushel, all varieties with the exception of the Large White Marrowfat, gave considerably more than 60 pounds per measured bushel, which is the standard weight for beans in Ontario. Four of the varieties gave an average of 65 or more pounds per measured bushel, the highest being produced by the Schofield Pea variety of beans.

Hairy Vetches for Seed Production.

During recent years, the Hairy Vetches have been considerably advertised for use as a farm crop. They have yielded well as a fodder crop, have furnished a considerable amount of pasture, and have been very highly spoken of as a cover crop for fruit orchards. The seed, however, is nearly all imported from across the Atlantic and is very expensive, usually costing fully $5.00 per bushel, and for general purposes from sixty to ninety pounds of seed are sown per acre. In each of the past seven years, the

Hairy Vetches have been sown in the autumn and allowed to ripen in the following year in connection with our experimental work at the College. In the average results for seven years, we obtained 5 bushels of the seed per acre per annum. It is, however, a very uncertain crop, as over 18 bushels per acre were obtained in one year and less than one bushel per acre was all that was realized in another year of this experiment. We find, however, by continuous growing of the Hairy Vetches and by thus using Canadian grown seed, we get decidedly better results than we do from seed which we have imported.

Grass Peas and Soy Beans.

Although Grass peas were grown quite extensively in the vicinity of Hamilton and in some other portions of the Province previously, the results from this crop have not been very satisfactory during the past few years, owing possibly to the seasons being somewhat colder and the rainfall a little heavier than the average. The Grass peas are used for green fodder, for cured hay, or for the production of grain.

The Soy beans are grown extensively in Japan, and their cultivation in the United States and in Canada, although yet very limited, has probably been increasing slightly. The crop furnishes exceedingly rich feed for farm stock. They can be fed in the green condition or placed in the silo with corn, or the crop can be threshed and the grain ground into meal. The meal is richer than that made from any of our ordinary farm crops, even including peas. There are a number of varieties of soy beans, but most of them are entirely unsuited for growth in Ontario, owing to the length of season which they require for their development and maturity. The Early Yellow variety, however, has proven to be one of the best for most parts of the Province, as it yields very well and matures early. In the average results of growing the Early Yellow soy beans at the College for thirteen years, we find the production to be 15 bushels of the threshed seed per acre. As the Grass peas and each of three varieties of soy beans have been grown under similar conditions in each of the past four years, we present the average results of these four different varieties of leguminous crops. The results were much lower in 1908, than usual.

Varieties.	Yield of Grain per acre. (lbs.)	
	1908.	Average 4 years.
Grass Peas	472	634
Medium Green Soy Beans	474	1,031
Ito San Soy Beans	430	932
Early Yellow Soy Beans	635	915

From these results it will be seen that the Medium Green surpassed the Early Yellow variety. It is, however, more difficult to cure the grain of the Medium Green soy beans as compared with that of the Early Yellow variety, owing to the fact that the former is later in reaching maturity.

Varieties of Flax.

Varieties of flax were obtained from Ontario, Manitoba, Holland, Russia, and from the Argentine Republic in the spring of 1905, and the varieties have been placed in comparative tests in our experimental grounds since that date. Six different quantities of seed per acre were used with each of the four first mentioned lots of flax, and this experiment was repeated in each of the past three years. In averaging the results of the six plots of each lot of flax for the four years, we obtained the following comparative yields of seed per acre: Manitoba flax, 18.9 bus.; Common flax, 17.9 bus.; Russian flax, 16.1 bus.; and Holland flax, 13.9 bus.

In another experiment we have made a comparison of seven different varieties of flax obtained from various sources. In the experiment for 1908, as well as that in 1907, the greatest yield of seed per acre was produced from the flax obtained from the central province in the Argentine Republic. Further experiments will be conducted with this variety of flax.

Varieties of Millet Grown for Seed.

Twenty-two varieties of millet were grown in our experimental grounds in a comparative test for seed production in 1908. Of this number, thirteen varieties have been grown for the last five years in succession. Those varieties producing the greatest average yield of seed per acre per annum were as follows: Siberian, 55.2 bushels and Steele Trust, 52.5 bushels. The Siberian variety has produced a very high yield of seed per acre in each of the years, the lowest being 39.5 bushels in 1908, and the highest 87.3 bushels in 1905.

Varieties of Corn for Husking.

Although 233,753 acres of corn were grown for the silo in Ontario in 1908, we find that no less than 299,690 acres were used for the production of corn for husking. Of this area, 77,449 acres were in Essex, 65,965 acres in Kent, 22,602 acres in Elgin, 20,069 acres in Lambton, and 16,974 acres in Middlesex counties. It will, therefore, be seen that the extreme south western portion of Ontario is the great centre for the growing of corn for grain production.

In 1908, eighty-eight varieties of corn were grown and the husked ears of each variety were carefully stored in racks and placed in the experimental barn. After the grain had become sufficiently dry, it was shelled and the yield of the shelled grain was determined for each variety. We find that the greatest yields in bushels per acre for the past year were produced by the following varieties: Farmers' Surprise, 70.1; Burlington Hybrid, 67.4; Early California Flint, 66.1; Wisconsin Little Dent, 65.6; White Cap Yellow Dent, 64.3; and Little Dent, 64.3.

Each of nine varieties of flint corn have been tested at the College for grain production in each of eight years. The following table presents the average of the eight years' results of these varieties of corn.

It will be seen that six of the varieties of corn here reported on have given an average of over 50 bushels per acre, one of the kinds; viz., the King Phillip, producing as high as 61.3 bushels of shelled grain per acre. Both the King Phillip and the Genesee Valley, which have given the highest results in the experiments at the College, have also given excellent

results in the co-operative work throughout Ontario. The Compton's Early, which is well known over Ontario as being an early twelve-rowed variety

Varieties.	Color of grain.	Average number of rows per ear.	Number of days until in full tassel. Average of 5 years.	Height of plants. Average of 5 years. (ins.)	Average of 8 years results.	
					Percentage of cob.	Grain per acre. (bushels.)
King Phillip	Red	8	83	98	25	61.3
Genesee Valley	Yellow	8	81	96	25	58.1
Longfellow	"	8	85	96	24	54.4
Farmers' Friend	"	8	78	74	21	53.1
Red Blazed	Red and yellow	8	81	96	25	52.6
Canada Yellow	Yellow	8	86	99	26	51.5
Compton's Early	"	12	85	100	30	49.8
Burlington Hybrid	White	8	87	93	29	49.5
Salzer's North Dakota	"	8	88	100	32	45.9

of yellow flint corn, has produced an average in yield of grain per acre considerably lower than a number of the other varieties.

White Cap Yellow Dent Corn for Grain Production.

As the White Cap Yellow Dent corn is grown extensively by a large number of farmers in the south western part of Ontario, it was considered wise to test this corn more carefully in the Experimental department. A number of painstaking farmers have been growing this variety for a considerable number of years and have carefully selected the best ears from year to year, and as the corn has become somewhat changed in its growth through its continuous selection and through its different environment, an experiment has been conducted with seed obtained from the different growers. The following table gives the average results of two tests conducted in each of the past two years in average height and total yield per acre, and also of the duplicate tests conducted in 1907 and in 1908 for grain production.

County.	Grower.	Average results for 2 years.				
		Number of days until in full tassel.	Height. (ins.)	Percentage of cob.	Tons of total crop per acre.	Bushels of grain per acre.
Essex	J. Hammond	77	111	21	13.70	52.7
Middlesex	E. M. Zavitz	76	116	24	14.78	51.8
Essex	W. Bryham	79	111	20	13.85	47.3
Essex	J. Thomas	80	116	22	13 63	44.0
Essex	C. Wigle	81	119	27	16.48	36.6

It will be seen that there is quite a variation in the results obtained from the White Cap Yellow Dent corn, the seed of which was obtained from different sources. These differences are, in all probability, due to the

various selections made by the different individuals for a considerable length of time under different conditions of environment. The greatest yield of shelled grain per acre was produced from the seed obtained from Hammond, and the lowest yield was produced from the seed obtained from Wigle. In view of total crop per acre, however, the seed obtained from Wigle produced the largest yield in each of the past two years.

Sunflowers for Seed.

It is quite true that sunflowers are not grown to any great extent as an economic crop in Ontario, and yet they are producers of large yields of seed. No less than seven varieties of sunflowers have been tested in the Experimental department, and of this number three have been grown for ten years in succession. Taking the standard weight for sunflower seed as being 20 pounds per measured bushel, we have obtained a yield in the average of ten years of 76.1 bushels from the Mammoth Russian, 75.9 bushels from the White Beauty, and 69.1 bushels from the Black Giant. These are certainly large yields per acre, but probably not much larger than might be expected from growing sunflowers under fairly good Ontario conditions. For this experiment, the seed is planted about the same as corn. Some farmers harvest the heads of the sunflowers and run them through the cutting box along with corn when filling the silo, considering that the silage is improved in quality thereby, owing to the fact that the sunflower heads contain a large amount of oil. The seed is quite frequently used as feed for poultry.

Varieties of Sorghum for Seed.

Thirteen varieties of sorghums were grown in 1908 for seed production. Of these, the greatest yields were obtained from the Australian Broom Corn, the Early Japanese Broom Corn, and the Chinese Cud Grass. In the average of six years' results we have obtained yields per acre as follows: Early Japanese, 29.1 bus.; California Golden, 28.7 bus.; and Improved Evergreen, 27.8 bus. In 1908, the yield of seed was comparatively light, being 20 bushels per acre for the Early Japanese, and slightly over 16 bushels per acre for each of the other two here mentioned.

Varieties of Potatoes.

The market value of the potatoes grown in Ontario in 1908, amounted to about twelve million dollars, but the acreage was slightly less than that of the previous year.

One hundred and eleven varieties of potatoes were grown in the Experimental Department in 1908. The crop was entirely free from rot, and the potatoes were of good quality. The highest yields per acre in 1908, were produced by the Holborn Abundance, 272.5 bushels, Early Michigan and Pearl of Savoy each 270 bushels, Montana Bluff 265 bushels, Rose's New Invincible 264.2 bushels, and Dempsey's Seedling 262.5 bushels. The Holborn Abundance also occupied the highest place in yield of potatoes in 1904, and also gave the sixth highest yield per acre in 1906. The Dempsey's Seedling which came sixth in the list in 1908, occupied third place in the yield of potatoes per acre in the year previous. Sixty-six varieties of potatoes have been grown in the Experimental Department in each of the five years. From a study of the experiments with different varieties of potatoes grown both at the College and throughout Ontario, we find the following to be amongst the best, when yield, size, freedom from rot, and

table quality are all taken into consideration: Late varieties; Empire State, Dempsey's Seedling, Rural New Yorker No. 2, and American Wonder: Medium varieties; Rose of the North and Burpee's Extra Early: Early varieties; Extra Early Eureka, Early Fortune, Early Puritan, and Early Harvest. The Holborn Abundance which is a late variety, has also made a high yield of potatoes per acre. From inquiries made throughout Ontario, from a large number of farmers, in both 1907 and in 1908, we learn that the varieties which are most extensively grown throughout Ontario are the Rural New Yorker No. 2, and the Empire State. Both these popular varieties of potatoes are white in color, good yielders, and generally of good quality. The Empire State has proven to be one of the very best in table quality, of some two hundred different varieties which we have tested at the College. The Rural New Yorker No. 2 is apt to grow rather coarse and produce hollow potatoes, on some of the rich soils in Ontario. On a sharp, warm, light soil however, the quality of the Rural New Yorker No. 2 variety is generally very good. It seems as though it would be wise for the farmers in the potato growing districts to confine their attention more particularly to the growing of one or two varieties of potatoes which yield well, are of good quality, and meet the requirements of the market, rather than divide their attention over so many different kinds. If large quantities of potatoes of the same variety, could be purchased, it would form great inducements for buyers to go into the localities and pay good prices.

Treatment for the Potato Beetle.

In the spring of 1908, we received a large can of Phenyle for the treatment of seed grain and potatoes, for the prevention of the ravages of insects. I take the following quotation from a letter received under date of March 18th.: "It will protect potatoes from potato bugs, if the seed is sprinkled with Phenyle." We conducted an experiment by sprinkling seed potatoes lightly and also quite heavily, and by planting the potatoes thus treated beside others which had not been treated. The experiment was conducted in duplicate, and careful observations were made. The results of the experiment show that the potato vines produced from the potatoes which had been treated with Phenyle were as badly attacked by the potato beetle as those which had not been treated in any form. In order to test the influence of different treatments for the Potato Beetle, six lots of each of two varieties of potatoes were carefully selected and planted on separate plots, in each of five years. After the potatoes had made sufficient growth and the Potato Beetles (Bugs) had made their appearance, five plots of each variety were treated in different ways, to destroy the beetle, and one plot of each variety was left untreated, as a basis of comparison. The five treatments made in each of the years were as follows: (1) Paris Green and water, by using one pound of Paris Green and 96 gallons of water per acre; (2) Paris Green and plaster, by using one pound of Paris Green and 38 pounds of plaster per acre and applying the mixture to the potatoes in the dry condition; (3) Potato Bug finish, which was applied dry at the rate of 20 pounds per acre; (4) Bug Death and water, by using on an average 32 pounds of Bug Death and 96 gallons of water per acre; and (5) Bug Death used in the same proportion as No. 4, but in the dry condition. Three applications of each of the five treatments were made with each of the two varieties of potatoes. In the autumn, the potatoes from each of the twelve plots were dug and weighed. The average results of the experiment conducted for five years in succession, showing the yields in bushels per

acre from each treatment, are as follows: Bug Death and water, 211.4; Bug Death dry, 203.5; Paris Green and water, 199.6; Paris Green and plaster, 183.3; Potato Bug Finish, 145.3; and untreated, 104.3.

In eight out of the ten tests made during the five years, those potatoes which were sprayed with Paris Green and water surpassed those which were dusted with Paris Green and plaster in yield of crop per acre. It will also be observed that the Bug Death and water gave better results than where the Bug Death was used in the dry condition. The Bug Death in solution gave considerably larger yields of potatoes per acre than the Paris green and water. From the potatoes which were left untreated and on which the potato beetles were allowed to work unmolested, there was less than half the yield of potatoes, as compared with the crop produced from the treatment with Bug Death and water. The usual prices of these insecticides when bought in quantity are about as follows: Paris green 20 cents; Bug Death, 7 cents; and Potato Bug Finish, 1 2-3 cents per pound. The cost therefore for the material used in the experiments conducted in the last five years was about as follows: Paris green and water, 60 cents; Paris green and plaster, 88½ cents; Bug Death, $6.72; and Potato Bug Finish, $1.00 per acre.

Other Experiments in Potato Growing.

A very large number of experiments with potatoes have been conducted in the Experimental department within the past twenty years. Many of the results of these experiments have been summarized in past reports of the College. Other tests with spraying mixtures, in the use of fertilizers and manures, in the selection of seed, etc., are now under way and we hope to obtain some valuable results when the experiments are conducted for a longer period of time.

Varieties of Mangels.

In 1908, 67,937 acres were devoted to the growing of Mangels in the Province of Ontario. When we realize the fact that the number of acres of Mangels in the Province, was 15,791 in 1882, 34,383 in 1895, and 67,937 in 1908, it shows the importance and the increase in the growth of the Mangel crop in connection with our agriculture. It seems quite safe to say that the Mangel crop is increasing in popularity from year to year. It is probably owing to the increase in the dairy industry and to the introduction of better varieties of Mangels, that the acreage devoted to this crop has been largely increased in late years. Mangels usually produce a large yield of roots which keep well and are relished by farm stock, and do not taint the milk when fed to milch cows. In 1908, twenty-seven varieties of Mangels were grown in the Experimental Department of the College. During the five years previous to 1908, the Yellow Leviathan variety of Mangel, produced the greatest average yield of roots per acre. There are three seedsmen in Ontario who advertise this variety in their catalogues, viz., Steele Briggs Seed Co., Toronto, D. M. Ferry, Windsor, and Jas. Hewer, Guelph. Therefore seed was obtained from each of these three sources and tested at the experimental grounds, with the result that each of these lots gave slightly over thirty tons of roots per acre, and yielded within one ton of each other. These were the only three lots that gave a yield of upwards of thirty tons of roots per acre. They were followed quite closely, however, by the Griewener Mangel, with 29.6 tons, Carter's Windsor Prize Taker Yellow Globe, 29.1 tons, and Sutton's Mammoth Long Red, 29 tons per acre.

In averaging results for the past five years, we find that the following varieties have produced the greatest average annual yields per acre.

Varieties.	Color of Roots.	Form of Roots.	Tons per acre.
Yellow Leviathan	Orange	Intermediate	32.6
Griewener	Yellow	Tankard	32.6
Ideal	Yellow	Tankard	32.0
Giant Eckendorf	Yellow	Tankard	32.0
Evans' Improved Mammoth Sawlog	Red	Long	32.0
Sutton's Mammoth Long Red	Red	Long	31.5
Long White	White	Long	31.4

It will be observed that the four highest yielding varieties of mangels in the average results for five years are either intermediate or tankard in form. The Evans' Improved Mammoth Sawlog and the Steele's Long Red Selected are very similar in form and in color, and the average results for fifteen years show a difference of less than one ton per acre. It is claimed that during the last three or four years, the seed of these two mangels has been obtained from the same source, and that the varieties are now identical. The Yellow Leviathan has been used in connection with the co-operative experiments throughout Ontario for five years, and has made a very high record indeed, being first in the list in four out of the five years in yield of roots per acre. Not only is it the highest yielder, but it also produced roots of a compact form, which are easily harvested, and are good in both keeping and feeding quality.

Canadian Grown Mangel Seed. But very little mangel seed is grown in Ontario, nearly all being imported from Europe. Owing to our severe winters and the cost of labour, it is difficult to produce root seed to compete with that imported from other countries where the climate is milder and the labour is much cheaper.

In the autumn of 1905, some very nice roots were selected from those grown in the experimental grounds and stored during the winter, and in the spring of 1906, were re-planted. From some of these, seed was obtained in the autumn, and was sown in the spring of the following year, in the experimental grounds. The yield obtained from the seed of the individual plants, varied considerably, but, on the whole, the results were very satisfactory. The seed from four of the plants gave higher yields than any of the twenty-six varieties of mangels grown in that year, from the seed which was imported. In the autumn of 1906 similar selections of mangels were made, and these were replanted in the spring of 1907. Owing, no doubt, to the peculiar weather conditions in the autumn of that year, the plants did not ripen their seed as satisfactorily as in the year previous. The results from our own seed in 1908, therefore, were not quite as satisfactory as those of the year previous. We were very successful, however, in producing excellent seed, during the past year, and have a larger quantity of this seed for experimental purposes in 1909 than on any previous occasion.

Varieties of Sugar Beets.

Two classes of sugar beets are grown in Ontario, one as feed for live stock and the other for sale for the production of sugar. With the first

object in view, the varieties mostly grown have roots of good size which grow considerably out of the ground and contain about 10 per cent. of sugar. When the object is sugar production, those varieties are grown whose roots grow almost entirely under the ground and which contain on an average, about 15 per cent of sugar. The roots of the varieties of sugar beets for sugar production, are also considerably smaller than those grown for feeding on the farm.

In 1908, twenty-one varieties of sugar beets were grown at the College, Of this number, the greatest yields were produced by the Giant White Feeding, Rennie's Jumbo, and Rennie's White Half Sugar. Of the twenty-one varieties referred to, fourteen of them have been grown for five years in succession. These include varieties which are usually grown for feeding to farm stock, as well as those which have been selected for many years, for the production of a high percentage of sugar. All varieties were grown in rows twenty-one inches apart, and the roots were thinned to a distance of seven inches apart in the rows. Those varieties which gave the highest average yield per acre for five years, are as follows:

Varieties.	Length in inches.		Percentage of Sugar.	Tons per acre.
	Above ground.	Under ground.		
Giant White Feeding	3.8	4.6	8.1	30.2
Tankard Cream	3.0	4.0	*8.6	25.5
Royal Giant	2.8	5.2	10.2	25.1
Giant Rose Feeding	3.2	5.2	13.0	24.1
Imperial Giant Half Sugar	2.9	4.9	†10.6	23 0
Rennie's Giant Sugar	.....	.....	†10.3	23.0
New Danish Improved	2.8	5.2	11.1	22.9
Hybrid Sugar Beet Mangel	2.4	5.6	†10.5	22.9
Red Top	1.9	5.9	11.2	22.1
White Silesian	1.0	6.1	13.7	20.9

* Average for four years. † Average for three years.

The Giant White Feeding variety of sugar beets is certainly a heavy yielder of roots per acre, the average being over four tons greater than that of the next highest yielding variety. It will be observed, however, that the sugar content of this variety is comparatively low. The Giant White Feeding not only gave a higher yield per acre than all the other varieties but one at the College in 1908, and stood at the top of the list in the average results for the past five years, but it has also given the highest average results in the co-operative experiments throughout Ontario, during the years which it has been distributed to various farmers for testing on their own farms.

Varieties of Swede Turnips and Fall Turnips.

Twenty-one varieties of Swede Turnips and four varieties of Fall Turnips were sown in the Experimental department in the summer of 1908. Owing to a lack of uniformity in the germination of the seed and the peculiar, warm, dry autumn weather which favored the development and the ravages of the plant lice, the results from both the Swede Turnips and the Fall Turnips, are unsatisfactory and unreliable, and are therefore not presented in this report.

Varieties of Field Carrots.

Acording to the latest report of the Bureau of Industries of Ontario, there were slightly more than four thousand acres devoted to the growing of Field Carrots in Ontario in 1908, and the average yield per acre for the Province, was 275 bushels. Nineteen varieties of field carrots were grown in the Experimental department in 1908. Of this number, fourteen varieties have been grown for five years in succession. Those varieties which have produced the highest average yield per acre for five years, are as follows:

Varieties.	Color.	Length of Roots in inches.	Tons per acre.
Steele's Improved Short White	White	8.6	30.5
Mastodon White Intermediate	White	8.9	29.2
Mammoth Intermediate Smooth White	White	8.5	29.1
Carter's Hundred Ton	White	8.2	28.1
Simmers' Improved Giant Short White	White	8.4	28.1
Sutton's Matchless White	White	8.5	27.1
Large White Vosges	White	6.6	24.7
Large White Belgian	White	11.1	24.6
Long Yellow Stump Rooted	Yellow	8.8	24.5

The intermediate White varieties of carrots are now taking the lead, not only in the yield at the College, but also in general cultivation throughout the Province. The Long White Belgian which used to be grown quite extensively, and which produced a comparatively light yield of roots, and was very difficult to harvest, has been dropped almost entirely out of the general cultivation.

As in the case of the mangels, the results from Canadian grown seed was not very satisfactory in 1908, which was probably owing to the fact of the unfavorable weather conditions when the carrot seed was maturing in the previous year.

Varieties of Kohl Rabi.

Kohl Rabi resembles cabbage in its root, and Swede Turnip in its leaf growth. The valuable part, however, grows about three inches above the ground, in the form of a bulb. It makes excellent food for domestic use, and is prepared for culinary purposes in much the same way as the Swede Turnip. Although grown to a certain extent in the Old Country as feed for sheep and other farm stock, it has not been grown to any great extent for farm purposes in Ontario. Four varieties were grown in the Experimental department in 1908, and three of these varieties have been under test in each of seven years. In 1908 the highest yield was produced from the Earliest Erfurt, and the second highest from the Early White Vienna. In the average results for the seven years, however, the Early White Vienna gave an average of 19.5 and the Early Erfurt, 19.5 tons per acre, while the Goliath Purple variety gave an average of only 16.2 tons per acre.

Varieties of Parsnips.

In order to obtain some information on the growing of parsnips with the object of feeding the same to farm stock, an experiment has been conducted in each of the past five years, in comparing two different varieties. The

average results for the whole period, show that the New Ideal Hollow Crown gave 10.6, and the Sutton's Cattle, 9.7 tons per acre per annum. The yields in 1908 were smaller than those for any of the four years previous, while those for 1907 were the largest of the five year period. It will be seen that the yields per acre given by the parsnips, are not nearly as large as those from the other principal classes of field roots. Although some inquiry has been raised regarding the value of parsnips as a crop for feeding farm stock in Ontario, our results so far have not justified the recommendation of the growing of this crop for that purpose, to any general extent.

Storage of Roots.

In each of the past five years, mangels, sugar beets, turnips and carrots have been pitted in the field, stored in the root cellar, and packed in boxes in sand, in order to get some information regarding the best methods of keeping roots, especially when the roots are for transplanting in the following spring for the production of seed. As it seems rather difficult to pit a small quantity of roots and have them under the usual conditions in which roots are pitted, this part of the experiment has not proven very satisfactory. In the other method of storing, however, we have found that the roots which were stored in piles in a cool root cellar, have come through the winter fully as well as those packed in sand, but in the latter case there was less sprout and mould, and rather more decayed roots.

Varieties of Corn for Green Fodder, Dry Fodder, and the Silo.

A somewhat smaller area is devoted to the fodder corns than to the husking corns in Ontario at the present time. The corn crop, where it can be grown successfully, furnishes a heavy yield per acre of both coarse fodder and of grain. The acreage devoted to this class of corn in Ontario increased from 200,354 acres in 1907 to 233,753 acres in 1908, according to the latest report of the Bureau of Industries for the Province of Ontario. There was also an increase in the yield per acre from 10.1 tons in the former to 11.7 tons in the latter. Those counties in Ontario which produced the largest quantities of these corns in 1908 are Oxford, 192,165 tons; Middlesex, 163,005 tons; Carleton, 143,949 tons; Dundas, 115,411 tons; Huron, 113,517 tons; Hastings, 105,901 tons; and Leeds, 105,456 tons. It will therefore be seen that the fodder corns are largely grown in those counties of Ontario in which dairying is developed to a large extent, although many of the other counties are now devoting a considerable amount of attention to the fodder corns. There are scarcely any parts of Ontario in which some one or other variety of corn will not thrive satisfactorily, unless it is in the Northern districts. Even beyond the limits where it was thought that corn could be grown, certain varieties have been cultivated and even ripened with a considerable amount of satisfaction. It is of the greatest importance, however, to grow those varieties which are particularly suited to the localities in which they are grown. It is important for each farmer to do a certain amount of experimental work for himself. Before doing so, however, he will find very great assistance from results of experiments which we have conducted at the College with a large number of varieties, where not only the total yield per acre, but also the yield of ears, stage of maturity, etc., are taken into consideration. The variety test conducted at this Station should serve as a general guide to the farmers in most parts of Ontario, indicating to them the kinds which are likely to be suitable for their respective localities. It is indeed impossible to mention any one variety of corn which is most suitable

for Ontario. The requirements of the various localities are so very different that it seems necessary to give the results of a large number of varieties which can be studied by individual farmers, in order that the greatest value from the experiments can be obtained. We are therefore presenting the average of five years' results in growing seventy-eight varieties of corn under uniform conditions. The varieties in this list are arranged according to the total yield of green corn per acre. For these experiments, the corn was usually planted during the last ten days of May and it was harvested about the middle of September. Immediately after the crop was cut, the ears were husked, weighed, counted, and examined. The stage of maturity of the corn was indicated by the condition of the grain at the time it was harvested. The seven terms which were used to describe the ripening of the corn at the time of husking were as follows: water, early milk, milk, late milk, dough, firm dough, and ripe. In each of the five years, the experiment was conducted in duplicate, and we therefore have ten distinct experiments conducted with all of these varieties within the five year period. The average results of the five years' experiments are given in the table on next page.

It will be seen from the results here presented that many of the varieties do not fully ripen at Guelph under the average conditions. In 1908, however, the corn matured unusually well at Guelph, a large number of the varieties producing ripened grain, although some of the large late varieties which are more suitable for the Southern States, never mature in this climate. As some of them are advertised, however, for growth in Ontario, it is well to have them included in the experiments so that the farmers will thus be enabled to see for themselves the comparison in stage of maturity, as well as in other respects, of the various corns grown in a locality which probably represents the average for the whole Province fairly well. When examining the results of experiments conducted at Guelph with the corn crop, it should be remembered that experiments have been carried on in a locality which is eleven hundred feet above the sea level and eight hundred and fifty feet above Lake Ontario, and in latitude north 43 degrees 38 minutes, also that Guelph is about thirty-eight miles inland from the lakes. Keeping these considerations in view, a large amount of valuable information can be gleaned from the figures presented in the table.

The results furnished in the tabulated form show us variations from 6.8 to 27.6 tons of green crop per acre, from less than 1 ton to 5.2 tons of husked ears per acre, from 2.7 to over 9 ounces in average weight per ear, from 55 to 134 inches in height of the total crop, and from 71 to 109 days from the time that the seed was planted until the crop was in full tassel. Between these extremes, we have a great many intermediate stages. In selecting a variety of corn for the silo, one should be chosen which furnishes not only a large total yield, but which is likely to reach a good stage of maturity in the locality where it is grown before the severe frosts appear in the autumn. From a study of the table, the superiority of one variety over another for any definite purpose is quite manifest. The reader can make many comparisons between the different varieties, and thus determine for himself the most promising kinds for him to test on his own farm, in order that he may find out the variety which will best meet his requirements. In the spring of each year, the Ontario Agricultural and Experimental Union distributes throughout Ontario seed for three experiments with corn: one with fodder corns, one with varieties of corn for husking, and the third with sweet corns for table use. As usually three leading varieties are distributed for each of these experiments, the farmers are thus enabled to ascertain for themselves which of the most promising varieties from the experiments conducted at Guelph will produce the most satisfactory results upon their individual farms.

VARIETIES OF CORN.

Varieties.	Description of varieties.		Average results of five years' experiments.					
	Class of corn and color of grain.	Average number of rows per ear, 5 years.	Condition of grain when harvested.	Number of days until in full tassel.	Height of plants.	Weight per ear.	Yield per acre.	
							Husked ears.	Total crop green.
					in.	oz.	tons.	tons.
1. Pennsylvania Early Dent.	Yellow Dent..	20	Early Milk.	103	132	8.22	3.52	27.58
2. Pedrick Perfected Golden Beauty	Yellow Dent..	12-14	Early Milk.	103	130	6.35	2.78	27.15
3. Austin's Colossai Yellow Dent	Yellow Dent..	16	Early Milk.	103	134	5.84	2.34	26.57
4. Henderson's Eureka	Yellow Dent..	16-18	Early Milk.	101	130	9.21	4.00	25.86
5. New Century Wonder	Flour	12	Water	109	119	2.87	.96	25.03
6. 100 Day Bristol	Yellow Dent..	14	Milk	99	126	7.53	3.70	24.83
7. Kansas Sunflower	Yellow Dent..	16	Early Milk.	102	129	5.62	2.83	24.39
8. Pride of Indiana	White Dent ..	16-18	Early Milk.	102	129	7.08	3.16	23.68
9. King of Illinois	Yellow Dent..	20	Early Milk.	102	129	7.54	3.12	23.47
10. Landreth's Large White Flint	White Flint ..	12	Early Milk.	101	129	5.97	2.92	23.42
11. Darke County Mammoth.	Yellow Dent..	18	Milk	96	121	9.50	4.44	22 22
12. Liberty	Yellow Dent..	16	Milk	96	121	8.28	3.92	21.79
13. Early Butler	Yellow Dent..	14-16	Milk	93	119	8.09	4.26	21.67
14. Cloud's Early Yellow	Yellow Dent..	20	Milk	99	123	8.79	3.77	21.59
15. Lenocher's Homestead	Colored Dent..	16	Milk	94	115	9.05	4.26	21.59
16. Salzer's North Dakota	White Flint ..	8	Dough	88	100	6.81	4.36	21.26
17. Mastadon Dent	Yellow Dent..	18-20	Milk	97	121	8.84	3.87	21.21
18. Hoopengardner's Very Early Yellow Dent	Yellow Dent..	16	Late Milk ..	89	111	10.47	5.17	20.93
19. Marblehead Mammoth	Sweet	12-14	Milk	93	94	8.06	4.13	20.88
20. Snow White Dent	White Dent ..	16	Milk	97	118	8.10	3.76	20 82
21. Golden Combination	Yellow Dent..	14-16	Milk	94	118	8.24	3.88	20.49
22. Reid's Yellow Dent	Yellow Dent..	16-18	Late Milk ..	94	117	9.02	4.18	20.42
23. Late Mammoth	Sweet	12-14	Milk	98	97	7.78	3.48	20.15
24. Golden Gate	Yellow Dent..	16	Milk	94	116	7.98	3.64	20.12
25. Home-builder	Yellow Dent..	16	Milk	92	116	8.45	3.94	20.05
26. Golden Triumph	Yellow Dent..	16	Milk	96	117	7.56	3.28	19.98
27. Lowe's Perfection	Sweet	12	Late Milk ..	88	90	7.91	4.76	19.88
28. Profit	Yellow Dent..	16-18	Milk	96	119	8.70	3.67	19.84
29. Improved Leaming	Yellow Dent..	16-18	Milk	96	116	8.30	3.55	19.83
30. Mammoth Cuban	Yellow Dent..	16-18	Milk	92	114	8.14	3.94	19.82
31. Mammoth Southern Sweet	White Dent ..	14	Early Milk.	99	120	6.91	2.89	19.79
32. Indiana Wonder	Sweet	12	Late Milk ..	86	96	5.53	4.06	19.68
33. Wisconsin Earliest White Dent	White Dent ..	14-16	Milk	97	111	7.68	3.42	19.62
34. Stowell's Evergreen	Sweet	14-16	Milk	95	94	7.18	3.61	19.41
35. Rennie's Improved Leaming	Yellow Dent..	16-18	Milk	98	117	7.59	3.05	19.40
36. Rennie's Early Giant White Dent	White Dent ..	14-16	Milk	94	110	8.40	3.97	19.39
37. Wisconsin Yellow Dent.	Yellow Dent..	16-18	Milk	95	111	7.72	3.76	19.24
38. Compton's Early	Yellow Flint..	12	Firm Dough	85	100	8.67	4.39	19.16
39. Country Gentleman	Sweet	.....	Milk	95	93	4.90	3 47	19.10
40. Potter's Excelsior	Sweet	12	Late Milk	91	88	5.72	4.07	19.05
41. Golden Era Dent	Yellow Dent..	16	Late Milk ..	90	114	8.49	4.19	19.00
42. Early Mammoth	Sweet	12	Milk	94	93	7.82	4.01	18.95
43. Mayfield Earliest	White Dent ..	14-16	Late Milk .	90	112	9.25	4.20	18.95
44. King of the Earlies Dent.	Yellow Dent..	14-16	Late Milk ..	89	111	7.43	3.85	18.87
45. Longfellow	Yellow Flint..	8	Firm Dough	85	96	6.42	3.73	18.85
46. Tuscarora	Flour	8	Dough	87	91	7.34	4.30	18.84

VARIETIES OF CORN.—*Continued.*

Varieties.	Description of varieties.		Average results of five years' experiments.					
	Class of corn and color of grain.	Average number of rows per ear, 5 years.	Condition of grain when harvested.	Number of days until in full tassel.	Height of plants.	Weight per ear.	Yield per acre.	
							Husked ears.	Total crop green.
					in.	oz.	tons.	tons.
47. Drought Proof Yellow Dent	Yellow Dent	16	Milk	90	114	8.01	3.84	18.82
48. Iowa Silver Mine	White Dent	14-16	Early Milk	97	116	7.91	3.58	18.65
49. Burlington Hybrid	White Flint	8	Firm Dough	87	93	5.52	4.09	18.65
50. King Phillip	Colored Flint	8	Ripe	83	98	6.67	4.07	18.31
51. Early White Cap Yellow Dent	Yellow Dent	16	Late Milk	92	110	8.25	3.65	17.76
52. Canada Yellow	Yellow Flint	8	Firm Dough	86	99	7.22	3.73	17.35
53. Hickox Sweet	Sweet	12	Milk	94	90	7.58	3.41	17.11
54. Clarke's Cuban Giant	White Dent	16	Early Milk	101	120	6.95	2.28	16.93
55. Pee and Kay	Sweet	12	Dough	83	80	6.92	4.51	16.71
56. Genesee Valley	Yellow Flint	8	Ripe	81	96	7.42	3.51	16.43
57. Red Blazed	Colored Flint	8	Ripe	81	96	7.40	3.95	16.41
58. Wisconsin Beauty	Sweet	12	Late Milk	86	80	8.45	4.67	16.35
59. University No. 13	Yellow Dent	16	Firm Dough	83	103	8.69	4.40	16.06
60. Black Mexican	Sweet	8	Dough	89	83	4.57	3.91	15.54
61. Crosby	Sweet	12	Late Milk	83	80	6.03	4.02	15.53
62. Asylum	Sweet	12	Milk	96	89	7.26	3.01	15.26
63. Landreth's Sugar	Sweet	14	Milk	96	91	6.56	2.80	15.26
64. Early Windsor	Sweet	12	Dough	79	73	7.50	4.51	14.42
65. Perry's Hybrid	Sweet	12	Dough	82	79	7.96	4.07	14.42
66. Early Minnesota	Sweet	8	Dough	80	72	5.48	3.77	13.89
67. Kendal's Early Giant	Sweet	12	Dough	81	73	7.53	4.45	13.82
68. Mammoth White Cory	Sweet	8	Dough	77	71	6.07	4.11	13.81
69. Farmer's Surprise	Yellow Flint	8	Ripe	82	89	7.13	3.02	13.59
70. New Early Champion	Sweet	12	Late Milk	92	79	7.06	3.31	13.17
71. Ford's Early	Sweet	8	Dough	77	72	6.18	3.91	13.12
72. Premo	Sweet	10	Dough	77	66	5.31	4.12	13.04
73. Wisconsin Little Dent	Yellow Dent	14	Firm Dough	76	95	8.50	4.09	12.98
74. Ringleader	Sweet	10	Dough	74	65	6.16	4.15	12.57
75. Farmer's Friend	Yellow Flint	8	Ripe	78	74	6.01	2.86	11.81
76. Golden Bantam	Sweet	8	Dough	77	63	4.00	3.13	10.98
77. Malakhoff	Sweet	10-12	Firm Dough	71	55	2.65	2.76	8.81
78. Peep O'Day	Sweet	8-10	Dough	71	55	3.72	2.69	6.79

Varieties of Sorghum for Fodder.

Under the name of Sorghum we include a variety of crops such as Sugar Cane, Kaffir Corn, Millo Maize, etc. Some of these are used principally for the production of syrup, others for furnishing material for the manufacture of brooms and whisks, and others almost entirely for the production of food for culinary purposes. All of these classes, however, are more or less valuable for the production of fodder for farm stock. The Sorghums are grown quite extensively in some States of the American Union. They thrive well in a comparatively dry, hot climate, where the corn makes a slow growth. At the College none of the varieties have been used for silage and only one variety, the Early Amber Sugar Cane, has been used extensively for pasture purposes. For the production of fodder however, seventeen varieties have been under experiment. Of this number, eleven of the varieties have been

grown in each of five years from 1904 to 1908 inclusive. The seed was planted each year in squares by placing about five seeds in a place and allowing 3⅓ links (26 2/5 inches) between the different plantings. When the Sorghum was about five inches in height, some of the plants were removed, thus allowing only three plants to remain in each place. The Sorghum was cultivated in about the same way as corn. The following gives the height, the yield of heads, and the total yield of green crop per acre of each of eleven varieties, and for the average of five years.

Varieties.	Height.		Yield of heads per acre.		Total yield per acre.	
	1908.	Average 5 years, 1904-08.	1908.	Average 5 years, 1904-08.	1908.	Average 5 years, 1904-08.
	inches	inches.	tons.	tons.	tons.	tons.
Orange Sugar Cane	110	109	.5	.6	21.5	23.2
Early Minnesota Sugar Cane	132	116	.8	1.2	24.4	19.9
Early Amber Sugar Cane	117	100	1.6	1.5	20.0	19.3
Kaffir Corn	69	74	.6	.8	14.5	14.9
California Golden Broom Corn	136	126	1.7	2.2	12.3	13.6
Early Japanese Broom Corn	134	119	2.0	2.2	13.5	12.7
Yellow Millo Maize	71	78	.8	1.0	8.6	11.7
Improved Evergreen Broom Corn	132	119	1.7	1.8	11.4	11.5
Australian Broom Corn	106	98	2.3	2.0	9.1	9.7
Brown Dhoura Corn	85	79	1.0	1.1	11.1	9.7
Jerusalem Corn	69	69	.6	1.0	5.1	6.9

In comparing the results from different varieties of Sorghum for the production of seed, given in the former portion of this report, it will be seen that the Broom Corns stood high in yield of seed per acre. In the results of Sorghums as grown for fodder crops, however, we find the Sugar Canes occupying the highest place in yield of green crops per acre. Of the different varieties of Sugar Cane in the experiment, the Early Minnesota gave the greatest yield per acre in 1908, but the Orange Sugar Cane furnished the largest amount of green fodder in the average results for five years. The Early Amber Sugar Cane is the best known variety throughout Ontario. Taking everything into consideration, it has given very good results indeed. The Kaffir Corn, regarding which we sometimes read extravagant statements in the newspapers, does not compare very favorably for growth in Ontario, with any of the varieties of Sugar Cane which we have had under experiment for at least five years. One variety of Kaffir Corn, however, the seed of which was obtained from the Rev. Mr. Grant, and which was sown in our experimental gounds in 1908 for the first time, is exceedingly promising. It grew very tall and the crop was quite uniform.

Varieties of Sunflowers for Fodder.

Considerable has been said regarding the advantages of using sunflower heads for mixing with corn, when filling the silo. It will be remembered by many, that Dr. J. W. Robertson strongly recommended the addition of horse beans and sunflower heads, to the corn for silage purposes. It was found, however, that the horse beans would not usually produce a satisfactory crop in Ontario, except in a few localities and in the more favourable years.

Sunflowers, however, thrive splendidly, producing large crops per acre. Seven varieties were grown in the Experimental Department for several years in succession, and careful notes were made regarding the productiveness and the growth of the different kinds. All the varieties have been discarded with the exception of the three which gave the most satisfactory results. Each of these three varieties has now been grown for thirteen years and the following represents the average yield in tons per acre, of heads, and of the whole crop of each of the three varieties: Black Giant 6.0 and 20.6: Mammoth Russian 5.7 and 16.8; White Beauty 5.8 and 16.4. The results of the White Beauty, however, are for eleven instead of thirteen years. The average results for the thirteen years also show the diameter of the heads and the height of the plants, to be as follows: Black Giant, 7.2 inches and 101.3 inches; Mammoth Russian, 7.5 inches and 94.7 inches; White Beauty, 7.5 inches and 86.4 inches.

Varieties of Millet for Green Fodder and for Hay.

Millet is grown in Ontario to a limited extent, for the production of seed, green fodder, hay and pasture. It is probably used more as a catch crop than as a regular crop in the ordinary rotation. It sometimes occurs that owing to unfavourable weather conditions, farmers are unable to plant their corn until it is too late to insure satisfactory crops. When this occurs, millet can frequently be sown at a much later date with excellent results. For fodder purposes, seventeen varieties of millet were grown in 1908. This number has also been grown for five years, and fifteen of them have been grown for at least twelve years. The following table gives the results for 1908, and for the average of five years, in height, yield of green crop, and yield of hay per acre.

Varieties.	Height (ins.)		Tons per acre.			
			Green fodder.		Hay.	
	1908.	Average 5 years 1904-08.	1908.	Average 5 years 1904-08.	1908.	Average 5 years 1904-08.
Japanese Panicle	42	45	11.5	11.0	4.7	4.6
Holy Terror Gold Mine	35	34	9.7	9.0	3.9	3.7
Magic	38	36	8.9	8.6	3.8	3.5
Golden Wonder	36	36	9.2	8.9	3.4	3.5
Japanese Common	36	35	9.0	8.8	3.3	3.4
Steel Trust	33	35	9.0	8.8	3.1	3.2
Hungarian Grass	35	33	9.3	8.4	3.2	3.1
Japanese Barnyard	35	40	5.0	8.5	1.8	2.9
California	35	34	8.6	8.0	3.2	2.9
Siberian	36	35	8.4	7.8	2.8	2.9
Early Harvest	36	36	8.3	8.1	2.6	2.8
Common	36	34	8.1	7.4	2.5	2.7
German or Golden	37	34	8.4	7.7	2.9	2.7
Hog	34	37	7.6	7.2	2.2	2.5
White French	32	35	8.1	6.8	2.4	2.3
Red French	28	28	6.3	5.6	1.7	1.6
Early Fortune	25	24	5.7	4.7	1.1	1.4

The Japanese Panicle Millet occupies highest place in yield of both green crop and hay per acre in 1908, and in the average of five years. The Japanese Panicle is probably the most popular variety amongst the newer

sorts which have been tested by the farmers throughout Ontario. It grows to a good height, stands remarkably well, has a good leaf development, and is relished by farm stock. In those localities which are early enough for it to thoroughly ripen its seed, it also produces a good yield of seed per acre. There has evidently been a great misunderstanding amongst seedsmen as to the different varieties of Japanese Millet, as a number of the seedsmen in advertising the Japanese Millet, have illustrated Japanese Panicle, and have described the Japanese Barnyard Grass. These two varieties are entirely different. The writer understands that the farmers, in a number of cases, have obtained the seed of the Barnyard Grass instead of the Japanese Panicle Millet variety. The Japanese Panicle Millet has a dark reddish brown seed, which is very smooth and shiny, and is entirely distinct from the lighter coloured and different shaped seed of the Barnyard Grass.

Dates of Sowing Millet.

For three years in succession an experiment has been conducted in order to glean some information as to the best time to sow millet seed, for the production of green fodder and hay. For this experiment, the Japanese Panicle, the Japanese Barnyard and the Hungarian Grass were the varieties used. The first seeding took place on the 2nd of May in 1906 and in 1907, and on the 4th of May in 1908, and the succeeding seedings every half month, until in all, seven sowings were made. It is difficult to make hay out of the crops produced from the late seedings especially in the case of the Japanese Panicle variety. The following table is the average yield of green crop per acre, produced in 1906, 1907, and 1908, of each of the varieties, from the different dates of seeding.

Dates of seeding.	Average number of tons of green crop per acre.			
	Japanese Panicle.	Japanese Barnyard.	Hungarian Grass.	Average 3 varieties.
May 3rd	9.40	6.51	6.89	7.60
May 15th	9.71	7.57	7.16	8 15
June 1st	11.07	9.12	7.44	9.21
June 16th	10.27	7.60	7.24	8.37
July 1st	8.91	8.56	7.77	8.41
July 15th	8.83	6.83	7.79	7.82
August 1st	.....	.....	3.17	.....

From an examination of the results of this experiment, it seems to indicate that there is a possibility of sowing each of these varieties of millets, at either too early or too late a date, even in the growing season, if the most satisfactory returns are to be obtained. The highest average yield of green crop per acre was produced by the Japanese Panicle Millet when sown on the 1st of June; from the Japanese Barnyard Millet also when sown on the 1st of June; and from the Hungarian Grass when sown about the middle of July.

Varieties of Rape, Kale, Cabbage, Etc., as Farm Crops.

Of this class of crops, the best known throughout Ontario, is undoubtedly the Pasture Rape, and the variety in this class which is used almost exclusively, is the Dwarf Essex. Other somewhat similar crops such as the large feeding cabbage, the different kinds of kale, the cultivated mustards, etc., are not so well known and have been but little grown in Ontario. Some of these are used more extensively in Great Britain. Twenty-five varieties belonging

to this class of crops, have been under experiment for five years, and eleven varieties for nine years in succession. The crops have all been sown in rows 3¼ links (26 2/5 inches) apart. Each plot was exactly one-hundredth of an acre in size, consisting of three rows each four rods in length. The seed was sown at the rate of about two pounds per acre. In order to give all varieties an equal chance, the plants in the rows were thinned to exactly two inches apart in every case. The land between the rows was cultivated occasionally throughout the early part of the growing season. The usual time of seeding has been about the middle of June. When the crops had reached about their best condition for feeding in the autumn, each variety was cut by the scythe and weighed in a green condition.

The crop is usually fed either to sheep or to hogs, and some times to young cattle. In England, the cabbage seed is frequently sown in the garden or in hot beds, and the young plants are transplanted in the field at sufficient distances apart to produce large heads of cabbage. This, however, requires a greater amount of labour, which is an important item in connection with agriculture in Ontario at the present time. In this experiment, the different varieties of cabbages have been treated in exactly the same way as the different varieties of rape and kale. The heads of cabbage have therefore been quite small, the growth being mostly leaf and stem. The quality, however, of these crops appears to be very good. The following table is the average results of this experiment:

Varieties.	Height (ins.)		Tons of green fodder per acre.		
	1908.	Average 5 years 1904-08.	1908.	Average 9 years 1900-08.	Average 5 years 1904-08.
Sutton's Earliest Drumhead Cabbage	23	19	20.8	24.4	27.8
Thousand Headed Kale	44	37	25.5	22.9	26.8
Sutton's Giant Drumhead Cabbage	22	21	27.6	.....	26.7
Sutton's Earliest Sheep-fold Cabbage	19	18	27.3	20.8	25.6
Large Seeded Yellow Flowering Rape	38	30	24.6	.....	24 2
Large Seeded Umbrella Rape	34	29	21.0	.....	24.0
Large Seeded Common Rape	36	31	20.9	.....	23.7
Marrow Collards	26	24	22.6	19.5	22.9
Sutton's Best-of-All Savoy Cabbage	17	18	21.5	19.0	22.3
Purple Sprouting Boroccoli	36	32	22.8	20.0	21.6
Dwarf Essex Rape	37	30	19.7	20.6	21.6
Dwarf Victoria Rape	32	29	19.1	20.8	21.4
Buckbee's Wonderful Dwarf Bonanza Rape	32	30	19.1	.....	21.4
Large Seeded White Flowering Rape	34	31	18.7	.....	21.0
Hardy Curled Kale	37	29	22.8	19.2	20.8
Cabbage Leaf Rape	39	33	21.1	.....	20.6
Jersey Kale	40	33	24.0	18.5	20.6
Brussel's Sprouts	28	26	17.5	14.9	17.2
New Chinese Mustard	60	61	14.1	.....	16.1
Bloomsdale Large Leafed Mustard	58	60	14.0	.....	16.0
Southern Giant Curled Mustard	59	53	17.3	.....	15.1
White Mustard	56	57	11.1	.....	13.3
Creole Mustard	54	53	11.6	.....	13.1
Brown Mustard	69	62	15.6	.....	11.1
German Rape	11	26	5.1	.....	5.7

The average of the five years' results show that of the four highest yielding varieties, three of them were cabbages. It will be seen that the Sutton's Earliest Drumhead Cabbage gave an average of 6.2 tons per acre per annum, more than the Dwarf Essex Rape. The Thousand Headed Kale has made a

very good record indeed. It should be remembered that the German Rape, as well as the different varieties of mustard, are annuals rather than biennials, thus coming into bloom in the same year in which the seed is sown, and are in this respect quite different from the other varieties included in the list here presented, which produce leaf and stem but not blossom, the first year. The cultivated varieties of mustard are sometimes sown in small quantities with the rape, in the Old Country. It is claimed that from this practice, there is not as great a liability of the sheep becoming bloated when pasturing on the crop.

The Leguminous Crops for Green Fodder.

In each of the past five years, eight different kinds of leguminous crops have been grown under similar conditions. These include Soy Beans, Vetches, and Cow Peas. Most of the varieties in each of these classes, require a fairly long season for growth and are more suitable for a warmer climate than that of Ontario. The following table gives the average results of this experiment for five years:

Varieties.	Average results for 5 years.	
	Height (ins.)	Tons of freshly cut crop per acre.
Medium Green Soy Beans	32	8.1
Grass Peas	33	7.3
Ito San Soy Beans	26	7.1
Early Yellow Soy Beans	26	6.2
Wonderful Cow Peas	16	5.5
Whip-poor-will Cow Peas	14	4.8
Hairy Vetches	31	4.6
Red Ripper Cow Peas	14	4.5

The Hairy Vetches can either be sown in the autumn or in the spring of the year. Owing to the fact that a great deal of the seed of the Hairy Vetches is produced in Germany or other European countries, it makes the seed quite expensive, frequently costing $5 or $6 per bushel. The Early Yellow Soy Beans generally ripen early in Ontario, and yield from 16 to 18 bushels of grain per acre. The meal made from the Soy Beans, is exceedingly rich and considered to be equal to Cotton Seed Meal in this respect.

Alfalfa or Lucerne.

A bulletin on Alfalfa or Lucerne was issued in the spring of the present year. The bulletin covered information of experiments conducted at the Ontario Agricultural College, and dealt with the following subjects: Thirty Cuttings of Alfalfa in Ten Years; Varieties of Alfalfa; Inoculation; Soil, Seed and Seeding; Influence of Manures and Fertilizers on the Alfalfa Crop; Uses of Alfalfa; Quality of Alfalfa as a Feed; Influence of Alfalfa Roots on the Soil; and Alfalfa Grown in Combination with Grasses and Clovers. Copies of this bulletin can be obtained by writing to the Department of Agriculture, Toronto. The following gives information on Alfalfa growing at the College, with the results for 1908 included.

Thirty-three Cuttings of Alfalfa in Eleven Years.

The following table gives the yields per acre of the different cuttings of both green fodder and of cured hay of the Alfalfa crop, as produced in the

Experimental department of the Ontario Agricultural College in each of eleven years:

Years.	Green Crop (tons).					Hay (tons).				
	First Cutting	Second Cutting	Third Cutting	Fourth Cutting	Total.	First Cutting	Second Cutting	Third Cutting	Fourth Cutting	Total.
1896.....	9.96	6.47	4.06	2.06	22.55	3.08	1.91	1.29	.65	6.93
1897.....	12.04	5.61	4.43	.....	22.08	3.59	1.56	1.23	.....	6.38
1898.....	9.71	5.85	2.64	.....	18.20	2.30	1.75	.63	.....	4.68
1900.....	11.93	6.00	1.60	.....	19.53	2 33	1.47	.80	.....	4.60
1901.....	9.70	2.20	7.49	.....	19.39	2.03	1.00	1.50	.....	4.53
1902.....	13.35	8.69	2.96	.....	25.00	2.50	2.02	.54	.....	5.06
1903.....	13.10	8.53	2.75	.....	24.38	2.50	2.09	.67	.....	5.25
1904.....	12.45	9.35	4.00	.....	25.80	3.40	2.50	1.08	.....	6.98
1906.....	9.78	6.60	4.85	.....	21.23	2.55	1.13	.58	.....	4.26
1907.....	14.55	3.95	.....	.....	18.50	2.95	1.05	.....	.....	4.00
1908.....	9.70	6.75	3.73	.....	20.18	2.50	1.15	.75	.....	4.40
Average 11 yrs.	11.48	6.36	3.50	.19	21.53	2.70	1.60	.83	.06	5.19

The foregoing results were obtained from different seedings which took place in various parts of the experimental grounds, mostly in comparative tests with different varieties of clovers. In every case the crop was sown in the spring of the year, at the rate of eighteen or twenty pounds of Alfalfa seed per acre, and usually with a grain crop, such as barley, sown at the rate of one bushel per acre.

In each of nine years, the Alfalfa gave exactly three cuttings, but in 1907 it produced only two, while in 1896 it gave four cuttings in the one season. It will be remembered that the spring of 1896 opened up very early, and that of 1907 exceptionally late. In 1896 the first cutting took place on June 1st and the second cutting on July 2nd, but in 1907 the first crop was not ready to cut until the 2nd of July.

It will be seen that the annual yield of Alfalfa per acre per annum in the average of the eleven years' experiments was 21.5 tons of green crop and 5.2 tons of hay. Hence, green Alfalfa furnishes about 24 per cent., or practically one-quarter, of its own weight in the form of hay. The first gives about double the yield of the second cutting, and the second nearly double the yield of the third cutting. It is generally more difficult to make good hay from the third than from either the first or the second cutting, owing to the unfavorable weather conditions. Within the ten years here referred to, the Alfalfa produced more than six tons of hay per acre in each of three years, and less than four and one-half tons of hay per acre in each of two years. Since 1888, well established Alfalfa at the College has been badly winter-killed on only one occasion and partly winter-killed on two occasions. It has usually survived the winter and the early spring in excellent condition. Unfortunately, the results for 1899 and for 1905 were not recorded sufficiently in detail to permit of their being used in the foregoing table.

Varieties of Alfalfa.

There appear to be a few varieties of the wild forms of Alfalfa which are characterized by differences in the color and in the size of the flowers, in the coverings and in the structures of the pods, etc. Botanical authorities, however, have not made it clear that there are marked differences in the botanical structure of the Alfalfa which is used in cultivation. It is, nevertheless, true that the continuous growing of Alfalfa for long periods of time

in different countries under varying conditions of soil and climate has furnished numerous strains of varieties which vary in important characteristics, when considered from a practical standpoint. Different forms or strains of Alfalfa are known principally by the country in which they have been grown for a number of years. Even this is very indefinite, as for instance, there appear to be different strains of Alfalfa produced in Turkestan, the value of which varies considerably. Much has been claimed in the United States and in Canada for the Turkestan Alfalfa. The results of experiments which have been conducted at Guelph, however, within the past ten years, show that the so-called Turkestan Alfalfa obtained through the seed trade of the United States and Canada, has displayed no perceptible advantages over the common variety grown in this Province. Wishing to obtain fuller information regarding the best sources of purchasing Alfalfa seed of the highest quality for use in Ontario we secured for experimental purposes samples of seed grown in different parts of the world. Some of these were obtained through the kindness and co-operation of the Department of Agriculture at Washington, and some were obtained direct by the College. In the spring of 1905, twenty-eight plots were sown in duplicate with Alfalfa seed obtained from different sources. From each of the plots three cuttings for hay were made in 1906, one cutting for hay and one for seed in 1907, and three cuttings for hay in 1908. The following table gives the average dates of the first appearance of the bloom in the three years, and the total yield per acre of green crop and of hay from the three cuttings in 1906, the one cutting in 1907, and the three cuttings in 1908:

Source of Seed.	Dates of first bloom. Average 3 years.	Total yield per acre. Three cuttings in 1906. *One cutting in 1907 and three cuttings in 1908.	
		Green Crop.	Hay.
	June.	(Tons).	(Tons).
Texas, Panhandle	19	47.6	11.9
Nebraska	16	43.1	10.8
Turkestan, Khiva	20	43.2	10.7
Turkestan, Samarkand	20	42.0	10.4
Chinese Empire, Sairam	20	39.6	10.2
New York	15	41.5	10.0
Nebraska	21	39.6	9.9
Montana, Northern	19	36.8	9.8
Russia, Simbirsk	17	41.6	9.8
Montana, Southern	20	38.3	9.6
Montana, Northern	18	39.5	9.5
Germany	15	37.3	9.4
Texas, Sherman	17	38.2	9.4
Utah, Irrigated	20	37.2	9.2
France, Poitou	17	39.2	9.0
Colorado	19	35.0	8.6
Ontario, O.A.C. Seed, 1904	18	36.5	8.4
Kansas	22	30.6	8.2
Utah, Non-irrigated	17	30.9	7.9
United States, First Quality Commercial Seed	15	32.3	7.6
Ontario, O.A.C. Seed, 1903	19	31.1	7.4
Italy	16	31 5	7.1
Turkestan, through Wm. Rennie, Seedsman, Toronto	21	28.9	6.8
Russia, Kharkoff	15	29.6	6.7
Turkestan, through Currie Bros., Seedsmen, Milwaukee	16	26.1	5.5
France, Provence	19	24.4	5 5
Arabia	20	3 4	.8
Peru		.0	.0

*Second crop cut for seed.

Examining individual plants of Alfalfa in the nursery plot.

Examining individual plants of oats in the nursery plot.

Testing weight per measured bushel.

It will be observed that the results obtained from the seed of the Turkestan Alfalfa which was obtained in America were decidedly lower than those obtained from the seed of the Turkestan Alfalfa obtained from Turkestan through the Department of Agriculture at Washington.

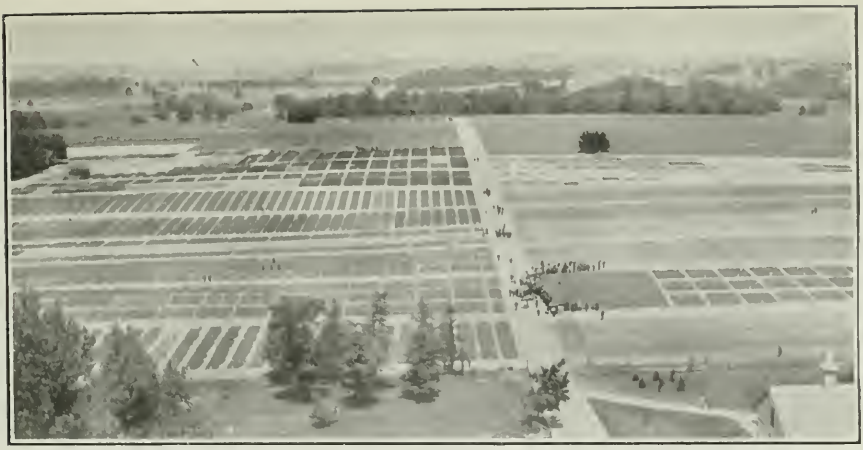
The plots which were sown in the spring of 1905 from seed produced at the College in 1904 and in 1903 gave quite similar results to the first quality of the commercial seed grown in the United States. It should be stated, however, that both the seasons of 1903 and 1904 were unfavourable in Ontario for the production of Alfalfa seed of average quality. It should also be taken into consideration that the seed produced in 1903 was over a year old when it was sown in the spring of 1905.

Alfalfa—Third crop of the season, seed obtained from the "Panhandle," Texas.

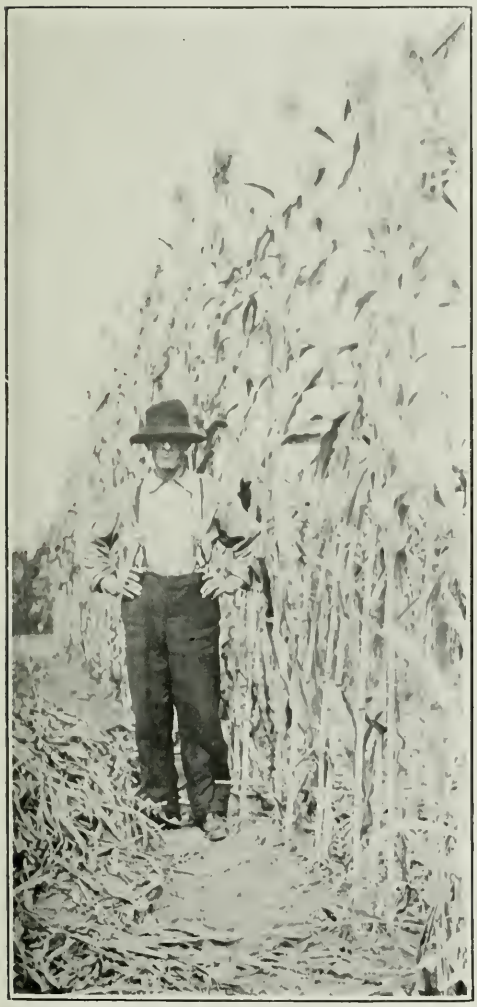
It is interesting to observe that the greatest yield of cured hay per acre was produced by seed obtained from the northwestern part of Texas.

Although the germination of the seed obtained from Arabia and from Peru was excellent, and the crop in each instance was very promising in the autumn of 1905, the plants of the Peruvian Alfalfa were completely killed, and those of the Arabian Alfalfa were mostly killed before the following summer. Both these strains of Alfalfa are giving particularly good results in the southwestern part of the United States, but owing to their acquired habits of growth prove to be exceptionally tender in Ontario.

In 1907, the second crop of Alfalfa, on each of the plots here referred to, was allowed to go to seeed. It was the desire to obtain seed of these different strains in order to continue the experiment, and to ascertain whether or not the seed obtained from the most productive kinds would continue to produce the best results. We hope that in time we shall be able to produce in Ontario a good supply of seed of the very best strains of Alfalfa.



Farmers viewing experimental plots.



Chinese Kaffir corn, 11½ feet high, on College trial grounds.

In the nursery plot of millet.

Sowing Alfalfa.

Alfalfa should be very carefully tested on many farms throughout Ontario. Its large yields of nutritious feed for farm stock, its perennial character of growth, and its beneficial influence on the soil, are all features which commend it very highly for those farms on which it can be grown successfully.

There are different ways of laying down a plot or a field to Alfalfa, and we would suggest the following method as one which is likely to give very excellent results. Select land having a clean, mellow, fertile surface soil overlying a deeply drained subsoil having no acidity. Use large, plump

Harvesting and making records of hybrid plants.

seed, free from impurities and strong in germinating power. Inoculate the seed with the proper kind of bacteria, providing Alfalfa has not been grown successfully on the land in recent years. As early in the spring as the land is dry enough and warm enough to be worked to good advantage, make a suitable seed-bed and immediately sow about twenty pounds of Alfalfa seed per acre from the grass seed box placed in front of the grain drill, and about one bushel of spring wheat or of barley per acre from the tubes of the drill. Smooth the land with a light harrow or with a weeder, and if it is very loose and rather dry, also roll it and again go over it with the harrow or the weeder. As soon as ripe, cut the grain and avoid leaving it on the land longer than necessary. Give the Alfalfa plants every opportunity to get a good start in the autumn in preparation for the winter. If for hay, cut each crop of Alfalfa in the following year as soon as it starts to bloom. In curing, try to retain as many of the leaves on the stems as possible, and to protect the crop from rain. Never cut or pasture Alfalfa sufficiently close to the ground to remove the crowns of the roots, and thus

injure or possibly kill the plants. If these directions are followed, the Alfalfa may be expected to produce large and valuable crops for a number of years without re-seeding.

Cattle feeding on the annual pasture crop.

Spraying potatoes.

Annual Pasture Crops.

In experiments extending for several years, we have found that the following mixture has given very good results indeed, for sowing in the spring of the year for furnishing pasture for cattle, in the same season in which the seed was sown. Oats 51 lbs., Early Amber Sugar Cane 30 lbs.,

and Common Red Clover seed 7 lbs., making a total of 88 lbs. of seed per acre. This mixture, in each of the past three years, has furnished pasture which has been greatly relished by animals, and has furnished a sufficient amount of pasture material to supply fully one animal per acre.

Nursery plot of Soy Beans.

Measuring height of plots of oats.

We have on each occasion obtained a good catch of Red Clover, which formed a good matting on the ground in the autumn of the year, ready to come through the winter and furnish a crop of Clover in the following season.

Respectfully submitted,

C. A. ZAVITZ.

PART XVI.

LECTURER IN FORESTRY.

To the President of the Ontario Agricultural College.

Sir,—I have the honour to present herewith the report of the Forestry department for the year 1908.

The courses of lectures as outlined in the College Calendar have been delivered to the second and fourth year students. Lectures and field work were also carried on with the Nature Study students during the summer session.

College Woodlots and Plantations.

The principal work done in the woodlots this past season has been a small amount of thinning and improvement cutting with the filling of gaps by planting.

Fig. 1 illustrates a plantation of Scotch Pine made about twenty-five years ago. This was a gravelly hillside of small value for cultivation. At a very small cost it was replanted and to-day is a valuable asset to the farm. I use this illustration to again urge upon our people the advisability of replanting poor soils on the farm.

The open portions of the south woodlot have been filled with White Pine transplants; this work being a continuation of work started in 1907. As stated in my 1907 report this planting is being done in September and is partially an experiment in autumn planting. The planting done in the

fall of 1907 has thus far proven quite successful, and I feel quite assured that where sufficient protection exists September planting of evergreens will be quite practicable.

This may be of advantage, as many farmers will prefer to do this kind of work in the month of September rather than in April or May.

In some of the open portions of the south woodlot we have tried autumn planting of Black Walnut. This planting has been done by dibbling in the nut without removing the husk. About four bushels of nuts were planted in this woodlot and about eight bushels were planted in the north woodlot.

Besides the planting of open spots in the woodlot a new plantation has been made at the northwest corner of the farm.

This is a continuation of the north woodlot and is a parcel of land which is difficult to drain. Last summer (1907) it was summer fallowed and this summer it has been used as a temporary nursery. After lifting the nursery material this autumn it was planted up with White Pine and Black Locust. The White Pine were three year old transplants and the Black Locust one year old seedlings. The spacing used was five feet and three feet.

Nurseries.

Our nursery work for the production of planting material has been the largest feature of the past season's undertakings.

Three different locations have been utilized to accommodate the growing demands of this work.

In the Holmwood nursery the following plants have been grown:

Tulip	(*Liriodendron tulipifera*)	2	year	old *T	825
Hardy Catalpa	(*Catalpa speciosa*)	2	"	"	1,625
White Ash	(*Fraxinus americana*)	2	"	"	3,875
Bitternut	(*Hicoria minima*)	2	"	"	250
Box Elder	(*Acer negundo*)	2	"	"	3,900
Black Cherry	(*Prunus serotina*)	2	"	"	1,100
Norway Spruce	(*Picea excelsa*)	4	"	"	4,500
Jack Pine	(*Pinus banksiana*)	2	"	"	48,000
Scotch Pine	(*Pinus sylvestris*	2	"	"	85,000
Riga Pine	(*Pinus sylvestris, var. Riga*)	2	"	"	10,000
Arbor Vitae	(*Thuya occidentalis*)	3	"	"	5,600
" "	(" ")	1	"	"†S	9,000
White Pine	(*Pinus strobus*)	4	"	" T	35,000
" "	(" ")	3	"	"	140,000
" "	(" ")	2	"	"	50,000
" "	(" ")	1	"	" S	135,000

In temporary grounds at the North Woodlot the following plants have been grown:

White Pine	(*Pinus strobus*)	3	year	old T	9,200
Norway Spruce	(*Picea excelsa*)	3	"	"	50,000
Scotch Pine	(*Pinus sylvestris*)	3	"	"	42,000

* T.—Transplants. † S.—Seedlings.

In the original nursery on the Macdonald grounds the following plants have been grown:

Tulip	(*Liriodendron tulipifera*)	2	year	old T	650
"	(" ")	1	"	" S	11,050
Chestnut	(*Castanea dentata*)	1	"	"	10,550
Burr Oak	(*Quercus macrocarpa*)	1	"	"	250
Horse Chestnut	(*Aesculus hippocastanum*)	1	"	"	210
Bitternut	(*Hicoria minima*)	1	"	"	550
Norway Spruce	(*Picea excelsa*)	4	"	" T	21,000
White Ash	(*Fraxinus americana*)	2	"	"	200
Silver Maple	(*Acer saccharinum*)	1	"	" S	2,000
White Ash	(*Fraxinus americana*)	1	"	"	3,780
Black Locust	(*Robinia pseudacacia*)	1	"	"	81,000
					766,115

Much of the above material is still small and has to remain longer in nursery lines. The greater part of this material has been shipped to the Norfolk County Nursery, which will be described elsewhere in this report.

Co-operative Planting.

This last season we have sent out about 375,000 plants for waste land reclamation. The material has consisted chiefly of White Pine, Scotch Pine, Norway Spruce, Jack Pine, White Ash, and Black Locust.

Owing to lack of assistance I have been unable to inspect plantations this last season and so can give no definite report as to results.

Through correspondence beginning to come in, I believe that last year's planting work has been largely successful.

Copy of Circular.

The following circular was printed and distributed during the year:

1. The Department of Agriculture of the Province of Ontario desires to assist farmers to improve their woodlots, and reforest waste portions of the farm. To accomplish this a system of co-operation is to be carried on as follows:

2. The Department, as far as the means at its disposal will permit, will assist in the growing of a forest plantation or woodlot, by directing through one of its officers as to preparation of soil, varieties to plant and manner of planting and as to care after planting.

3. The Department will also endeavor to furnish seedling trees or cuttings, as planting material, free of charge, but the person receiving such material shall pay the cost of transportation by express to nearest express office. Express charges on planting material for two acres will range from one to two dollars, at points one hundred miles from Guelph, depending on the kind of planting material.

4. The Department advises that those undertaking waste land planting make a start of one acre the first season. Two acres will be the largest area for which the Department will undertake to furnish planting material in any one year Larger areas may be planted by arranging to continue the work through successive seasons.

5. It shall be understood that the owner, on his part, must prepare the soil, plant and care for the trees, and do all the actual work in connection with the plantations,

in accordance with the directions of the officer of the Department. Prospective planters should read pages 19 to 32 of Farm Forestry, Bulletin 155, Ontario Department of Agriculture, which will give a more detailed idea of what waste land planting means.

6. The owner shall also agree to provide protection for the planted trees against animals by fencing or otherwise, and where necessary, against fire by some effective means.

7. The Department prefers to make plantations on such waste portions of the farm as steep hillsides, light sandy, rocky or gravelly spots, swamp land, portions of farm cut off by streams or otherwise. Such land can usually be profitably devoted to wood production if proper species are planted. However, in certain localities without woodlands it may be found advisable to plant on good agricultural soil, if the owner so desires. In cases were tillable land is to be planted, it will be advisable to summer fallow. Cultivation for one or two seasons after planting on good soils, where rank weed growth might follow, will be of great benefit to plantation.

8. It will be noticed that this system is co-operative in character. The Department furnishes planting material and expert advice, but does not guarantee to furnish any specific quantity of planting material. The Department reserves the right to accept or refuse applications if in the opinion of the officer in charge the location offered does not afford satisfactory facilities for the experimental and educational features of the work.

9. It is desired to make this work of educational value, and the owner will be required to allow public inspection of the planted areas, whenever this can be done without injury to other crops.

10. Attention is called to the fact that the Forestry Department furnish trees only for plantation work on waste land, or land which is undesirable to till for annual crops. No fruit trees, ornamental trees or shrubs, trees for town or village lots, Norway Spruce for hedges or windbreaks, will be supplied by this Department. As may be inferred from page 24 in Bulletin 155, the planting material sent out under this system is unfit for roadside or ornamental planting but is intended to make forest plantations.

11. Upon applying to the Forestry Department, Ontario Agricultural College, Guelph, the applicant will be furnished with a blank form for the purpose of describing the area it is proposed to plant, which should be carefully filled out and returned to the Department.

12. Applications coming in late in the spring may have to be held over for the following season's distribution.

Address all communications,

FORESTRY DEPARTMENT,

Ontario Agricultural College, Guelph, Ontario.

Collections of small forest trees have also been sent out to about seventy-five schools in the Province.

These collections were made up of the following: White Pine, Scotch Pine, Norway Spruce, Arbor Vitæ, White Ash, Black Walnut, Butternut and Tulip.

These seedlings have been placed in school gardens or other suitable locations and are expected to accomplish the following:

The students through handling and caring for these trees will come to know them.

They can be transplanted when larger to portions of the school grounds or taken home by the children for planting about the home.

This work should give many children a more vital interest in trees, which in itself will repay the effort.

RECLAMATION OF NON-AGRICULTURAL LANDS.

As was intimated in last year's report (1907) there exists in old agricultural Ontario some few hundred square miles of unimproved lands which are only suited for forest crops.

This last year the policy of segregating and placing these lands under management has been inaugurated. One hundred acres of land has been purchased in the South Norfolk waste area and the nursery work at Guelph has been moved to this location. This land lies at the border of an area over 3,000 acres in extent.

In Figs. 2 and 3 are shown the buildings of the first farm bought. This property left the Crown in 1804 and comes back to it in 1908, a period of over 100 years. It has all been cleared with the exception of about 15 acres. This 15 acres is typical of the greater portion of the Walsingham Township waste lands. It is covered with Scrub Oak and scattered scrubby

White Pine. If protected from ground fires this would soon fill with White Pine. I wish to point out the fact that much of this type of land in the Province does not present so much a problem of replanting as of fire protection through proper management. The scattered scrub or defective White Pine which the lumbermen left are always endeavouring to reproduce, but every few seasons ground fires sweep over and kill the young Pine.

Management of this Norfolk forest station should embrace the following problems:

Nursery. The nursery work at Guelph is being moved to Norfolk because there is plenty of suitable soil available at a very low cost. In nursery management it is necessary to have a permanent staff of trained men. At Guelph it was difficult to find winter employment for these men. By managing the nursery in conjunction with the waste land problem winter work can be given with advanatage to both propositions as will be shown.

In the past we have been importing White Pine seedlings at a very low cost. I think that we shall now be able to produce White Pine planting material at a cost of very close to that of the German material.

We expect this year to put in about 100 lbs. of White Pine seed and also seed of Red or Norway Pine, Arbor Vitæ, Jack Pine, and various other species.

It is advisable to have government nurseries capable of producing planting material for the co-operative work with farmers and Public Schools. There is also developing a demand for planting material by corporations and private individuals on a larger scale than we have been able to supply through our co-operative work. As there are no commercial nurserymen meeting this demand it would be advisable to assist along this line. I would suggest that planting material be supplied at cost, as soon as possible, to such persons as desire to reforest waste areas on a larger scale than provided for in our plan as outlined in above circular.

Replanting. Wherever there is no chance of natural reproduction coming in, replanting work should be done. This planting should be of an experimental character determining cost, suitability of species, etc

Improvement Cutting. As was previously pointed out much of this land will not require replanting.

It is covered with Scrub Oak with young Pine as an undergrowth. Wherever the soil is best suited to White Pine it will be advisable to cut the Oak and favour the Pine. All of the Oak cut can be taken out at a profit. Considerable of the material is of fence post size.

Wood Preservation. Considerable attention is now being given by various countries to preservative treatments for wood which comes into soil contact. It is found that the creosote treatment of a fence post adds from 6 to 10 cents to its cost but makes it from three to four times as durable.

It would be advisable to have a creosoting plant at this Norfolk County station and utilize much of the Scrub Oak in this way. From German experience it is found that such a post will last from 20 to 25 years in the ground.

Respectfully submitted,

E. J. ZAVITZ.

PART XVII.

THE LECTURER IN ECONOMICS.

To the President of the Ontario Agricultural College.

SIR,—I have the honour to submit herewith the report of the Department of Economics for 1908.

The courses of lectures as outlined in the College Calendar have been delivered to Second and Third year students. It has been found impracticable to hold a Fourth year class in Economics during the Fall Term. This is largely due to the fact that the largest section of the class,—the Agricultural Optionists—having to examine stock in different parts of the province, would be obliged to miss a large portion of the lectures given between October and Christmas. Arrangements have been made, however, for a lecture period with this class each week during the Winter Term. This, though altogether inadequate to meet the demands of men about to enter upon work, for the most part, of a public nature, should, nevertheless, prove very helpful.

The Sophomore and Junior Classes, in addition to the regular lecture work, are required to make simple economic investigations upon various subjects in different parts of the country. Subjects such as, "Farm Labour Conditions," "Co-operation," "Economic Comparisons of the Products of two or more Counties or Provinces," "Large *vs.* Small Scale Farming," "The Status of Particular Industries in Different Sections of Country," "The Agricultural Resources of Canada," "The British Embargo against Cattle," "Business Methods on the Farm," "Machinery in Agriculture," "Tenant Farming," "Immigration and Agriculture," "Government Aid to Agriculture," "Land Laws of Canada," "The Good Roads Problem," are among a very large number of questions which are being investigated. In all the work of this nature that has been attempted, I have pleasure in reporting that, almost without exception, it has been carried on in a most intelligent and creditable manner. Many of the papers are indeed worthy of a place on our library shelves. In all, the results of this phase of the Economic work have been sufficient to prove to my entire satisfaction that the class of students coming to this College are highly capable, with proper direction, of grappling with the most difficult economic problems of the day.

OUTSIDE WORK. During the months of May, June, July and August, it was my privilege, under the direction of the Deputy Minister of Agriculture, to commence an agricultural study of the Province from an economic point of view. The County of Lincoln, which was chosen as the first field of work, occupied the whole of my time during the four months. In fact a much longer period might have been devoted to this section to good advantage. The study was designed to cover such questions as the location and character of the different soils and crops grown upon them; methods of farming practiced, specialties, etc.; rotations most favoured; market and transportation facilities; methods of road-building and character of the roads; possibilities of developing certain industries such as, fruit produc-

tion, dairying and horse raising; land values, as indicated by prices obtained for farms recently sold; and other questions of a general nature having a bearing on agriculture. This work proved very attractive, and besides, has furnished me with a lot of most useful information. A full report of my investigations is being sent in another paper to the Department of Agriculture, Toronto.

English. In addition to my regular economic work, I have been requested by the President and Professor Reynolds to take Second and Third Year in English Composition. This is by far the most onerous of my teaching work, and really requires a great deal more time than I have been able to devote to it. In no branch of their education are the students who come to this College weaker than in this subject. Consequently, unless endless pains are taken in the examination of their work and an enormous amount of practice afforded them, the Agricultural College must come face to face with the unique problem of graduating a class of semi-illiterate men.

Every week throughout the term the students of Second and Third Years have been required to hand in a short essay upon an assigned theme. These have been read, marked, and handed back with errors pointed out and means of improvement suggested from time to time. In this way great progress has been made, but a great deal still remains to be done.

In the opinion of the writer, we have reached a place where a man's whole energies might be devoted to good advantage to this subject.

Respectfully submitted,

H. H. LeDREW.

PART XVIII.

DIRECTOR OF HOME ECONOMICS.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to submit herewith the fifth annual report of the work of the Home Economics department, for the year 1908.

THE YEAR'S WORK.

The Home Economics department has been almost wholly occupied this year with the instruction of students, the majority of whom returned to their own homes to put their training into practice. No new courses have been opened, and only minor changes have been made in the old. The outstanding feature of the year is perhaps the rapid increase of long course students. The roll in September, 1907, showed sixty students entered for one and two-year courses, while September, 1908, showed eighty-seven.

THE DIFFERENT COURSES.

1. *The Normal Course.*

Eight entered the two-year course in September, 1906; four passed into the senior class in September, 1907, passed the final examinations in June, 1908, and have received the Macdonald Institute Teachers' Certificate in Domestic Science. Thirteen entered the course in 1907; twelve passed on to the senior class in September, 1908, and are now in attendance. Twenty students entered the junior class last September.

Six experienced teachers entered the one-year course in September, 1907; all passed the final examinations in June, 1908, and have received the Macdonald Institute Teacher's Certificate in Domestic Science. Another student without teacher's experience was allowed to take the work of this class in preparation for a special position, but was not granted the Macdonald Teacher Certificate. Last year we could have accepted more students; this year we were obliged to refuse several applications owing to the larger number coming forward from our junior class.

The Guelph Public and High Schools sent us four classes from January until June, for practice-teaching. The number was increased to five in September, because of the larger senior class.

No change has been made in this course during the past year.

2. *The Housekeeper Course.*

Four students entered this course in September, 1906; one dropped out shortly before completing the course in order to take a position, two dropped out in the third term on account of ill health, and one received the Macdonald Institute Housekeeper Certificate in June, 1908. Three entered the course

in September, and two more were admitted in January, 1908; all passed on to the senior class in September, 1908. Two more entered the senior class (by virtue of Homemaker course work) in September, and six are now in attendance. Eight entered the junior class in September.

This course has been fully justified by results, and it is encouraging to note the increase in this year's class. For the benefit of capable and strong women who are looking for a new field of work we repeat the description of this course given last year.

This course is a professional one offered to mature women who have had a good deal of housekeeping experience at home and desire training to fit themselves for housekeepers or dietitians in larger institutions. They are expected to have good executive ability before entering; the course aims to give them correct standards in the preparation of food, housework, sanitation, etc.; and to train their executive ability along the lines of institution requirements. They are required to take the same science and practical work as the Normal students, but instead of studying school equipments and methods of teaching, they study methods of administration for large buildings such as our own residence for women. Each student is in turn required to act as marketwoman, loan clerk, and classroom housekeeper, doing the clerical work of each office. With Miss Tennant's assistance and instruction they investigate the working of Macdonald Hall. Part of this investigation consists of becoming a dining-room maid, a house-maid, and a kitchen-maid for a short time in order to gain accurate and intimate knowledge of the duties and difficulties of each position.

The graduates readily find employment, and several have been at work long enough to demonstrate their success. The demand for them is increasing rapidly, but we have no hope of meeting the demand at present. This is a pity, because the salaries offered are as good, and in many cases better than those of the average domestic science teacher. There are many capable women in the Province to whom this work should be attractive when they realize its possibilities. Two years of time, and three hundred and sixty dollars in money, seem a good deal to spend after a woman has reached mature years, but a comfortable income and a good home is worth the time and the money.

3. *The Homemaker Course.*

Twenty-eight entered this class in September, 1907; twelve passed the final examinations last June and have received the Macdonald Institute Homemaker diploma. Thirty-seven entered last September and are now in attendance.

The number who drop out of this course is very large, chiefly because many girls and many parents fail to realize that the course calls for a great deal of hard, earnest mental work as well as plenty of practical work.

The course is evidently a very attractive one. As usual we have had more applicants for it than could be accepted this year, and the prospect for next year is similar.

4. *The Short Course in Domestic Science.*

This course which is given three times each year, has crystallized into a very satisfactory practical course and is sufficiently elastic to fit most of the students taking it. There were in attendance this year in the Winter term, January to March, 48; Spring term, April to June, 21; Autumn term, September to December, 25; total, 94.

5. *The Short Course in Sewing.*

This new course, offered in the Spring and Autumn to meet the demand for a short course in sewing and allied subjects, has been satisfactory. Our staff can handle but one small class in the practical sewing work of this course, but so far it has met the demand. Its object is to do everything possible to help the girl who is anxious to learn to do the simple dressmaking required in the average home.

There were in attendance this year in the Spring term, April to June, 9; the Autumn term, September to December, 11; total, 20.

6. *The Summer Course in Domestic Science.*

Only eleven students entered this course last July. There is apparently no great demand for such a course in the Summer. This may be because for several years past every Normal School student in Ontario has had similar training, and few teachers of earlier training are sufficiently interested in the subjects to give up holidays for them. It may also be because there is no special inducement in the way of bonus or increased salary when the teacher returns to the school. It may also be due in part to the heat of July weather, which does not make cooking and sewing attractive to tired teachers. It must be said, however, that the teachers who formed this class were faithful students.

Special and Optional Students.

Two Normal graduates of 1908, and one Women's Institute lecturer, sought and obtained permission to spend three months at Macdonald Institute reading in our library on the subject of Dietetics.

Many of the optional students in the Spring term were students who dropped out of the Homemaker class for various reasons. These were required to fill up their time with classes, the rest were townspeople who took but one or two classes. There were in attendance for six months, 4; for three months, 23; total, 27.

Student Workers.

The arrangement by which a few girls are enabled to defray the cost of a short course by means of work instead of money is still carried on. This year nine girls have thus earned a three months' course in domestic science. They expressed themselves well satisfied with the arrangement.

Special Lectures, Meetings, etc.

The special marketing lectures were again carried out by College professors, and most of them were illustrated with numerous samples of the foods talked of. They were as follows: Vegetables, Mr. Crow; Fruit, Prof. Hutt; Canned Food, Prof. Edwards; Cereals, Prof. Harcourt; Meat Cuts, Prof. G. E. Day.

This department was represented at the Ontario Educational Association last April, and at the Lake Placid Conference held at Chautauqua, N.Y., last July, by myself. Miss Ferguson attended the Toronto Horticultural Show in November, in order to take part in judging the preserved fruit exhibit.

Mr. Putnam, Superintendent of Women's Institutes, held a two-day session with his Institute lecturers in Macdonald Institute last April, preparatory to their series of summer meetings.

Two sewing exhibits were held this year, one in June, while the summer excursionists were at the College, and the other in December, during the week of the Experimental Union and Women's Institute Convention. They excited much interest because the exhibits consisted only of work done by students of the sewing classes for one term, and gave a very fair idea of the work of our sewing department.

The pressure of class work which continues from September until the end of June is too great to permit of much experimental work. One series, however, was carried out for Prof. Harcourt, a report of which with his kind permission is inserted here.

Report of Experiments with six Different Flours, to Determine Whether Strong Wheat or Soft Wheat Flour is Best for Milk Biscuits made with Baking Powder.

The flours used were obtained from the manufacturers for other purposes, but were regular brands which might have been bought in the open market, and were chosen as likely to yield decisive information. They were:

A. Strong—a high patent flour made wholly of Manitoba wheat.
B. Strong—a high patent flour made wholly of Manitoba wheat.
C. Soft—a nearly straight grade flour made wholly of Ontario wheat.
D. Blend—a combination of 20%B. strong and 80% C. soft.
E. Soft—an 85% soft wheat flour made wholly from Ontario wheat.
F. Soft—a 35% soft wheat flour made wholly from Ontario wheat.

The Macdonald Institute recipe for milk biscuits was taken as the starting point and a series of experiments carried out to determine various points before making the final test. In every baking each ingredient was carefully weighed, the biscuits compared with others, and results recorded to guide the procedure of the next experiment. When rolling out the dough before cutting the biscuits, flat sticks of equal thickness were laid on either side for the rolling-pin to travel upon, so that the biscuits of all bakings were as nearly alike in thickness before baking as was possible with dough of such slackness. Only the biscuits cut from the first rolling were baked, so that no biscuits were made from dough that had been worked over.

Experiment 1.

A batch of bakings with A. strong flour to decide what proportion of fat and baking powder, and what oven temperature yielded best results.

Baking No.	Flour.	Weight in grams of—								Oven Temp. Fr.	% loss in baking.	Remarks.
		Flour.	Fat.	Salt.	Bak. Pow.	Milk.	Dough.	Biscuits.				
								Raw.	Baked			
1.	A. Strong...	150	10	...	6	120	286	139	108	500	22	Oven too hot.
2.	A. "	150	12	....	6	120	288	136	115	400	15	Oven too slow.
3.	A. "	150	12	....	7	120	289	129	111	460	14	Very good.
4.	A. "	150	12	....	8	120	290	128	110	450	14	Excellent.
5.	A. "	150	12	1	8	120	291	124	105	430	15	Very good.

Butter was the fat used in batches 1, 2, 3, 4, while lard with a little salt was used in 5. The flavour of 5 was not quite so good as that of the others. Had home-tried lard been available and a little more salt used, they would have been almost as good.

Conclusions: 12 grams. fat, 8 grams. baking powder and oven temperature of 450 gives best results.

Experiment 2.

A batch of bakings with B. strong flour to test above conclusions and help determine milk proportion. The idea being to secure dough of the same slackness with each flour.

Baking No.	Flour.	Weight in grams of—								Oven Temp. Fr.	% loss in baking
		Flour.	Salt.	Bak. Pow.	Fat.	Milk.	Dough.	Biscuits.			
								Raw.	Baked		
6.	B. Strong.....	150	.....	7	12	120	289	108	92	465	14
7.	B. "	150	.....	7	12	120	289	119	97	400	18
8.	B. "	150	.....	8	12	120	290	112	92	430	17
9.	B. "	150	1	8	12	120	290	118	99	430	16

Remarks: The dough of 6, 7, 8, and 9 was considerably slacker than of 1, 2, 3, 4, and 5. Lard with salt was used for 9, and butter for the others. Since home-tried lard was not available, it was decided to use butter as the fat for all succeeding bakings.

Conclusions: 150 grams flour, 12 grams butter, 8 grams baking powder, with an oven temperature of 450 gives best results.

Further tests necessary to determine proportion of milk for different flours.

Experiment 3.

A batch of bakings to determine the proportion of milk needed for each flour in order to have each dough of the same slackness.

Baking No.	Flour.	Weight in grams of							Oven temp. Fr.	Per cent. loss in baking.	Remarks.
		Flour.	Butter.	Bak. Pow.	Milk.	Dough.	Biscuits.				
							Raw.	Baked			
10.	A. Strong...	150	12	8	135	305	122	94	450	23	Too slack.
11.	B. " ...	150	12	8	125	295	118	97	450	17	A trifle stiff.
12.	B. " ...	150	12	8	130	300	117	96	450	18	A trifle slack
13.	A. " ...	150	12	8	130	300	130	105	450	19	Excellent.
14.	C. Soft.....	150	12	8	118	288	112	89	450	20	A trifle slack
15.	D. Blend....	150	12	8	119	289	111	94	450	15	.....
16.	E. 85% soft.	150	12	8	114	284	107	87	450	18	A trifle slack
17.	F. 35% " .	150	12	8	111	281	120	101	450	15	A trifle stiff.

Conclusions: To test the flours further with a larger quantity of flour, proportioning milk in accordance with above remarks. Also to notice what might be called the "handling" quality of each dough when all are of uniform slackness. Weak flour seems easier to handle in a soft dough than a strong flour dough which is very sticky when made very slack.

Experiment 4.

A batch of baking with the quantities of ingredients doubled, in order to further test the proportion of milk necessary.

Baking No.	Flour.	Weight in grams of							Oven temp. Fr.	Per cent loss in baking.	Remarks.
		Flour.	Butter.	Bak. Pow.	Milk.	Dough.	Biscuits. Raw.	Biscuits. Baked			
18.	A. Strong...	300	24	16	260	600	457	393	450	14	Too slack.
19.	B. " ...	300	24	16	256	596	444	397	450	10	" "
20.	C. Soft.....	300	24	16	232	572	445	403	450	14	Right.
21.	D. Blend....	300	24	16	Reco	rd des	troyed	by acc	ident		Try 221 gram's milk.
22.	F. 35% soft..	300	24	16	218	558	431	389	450	9	Same as 20.
23.	E. 85% " ..	300	24	16	222	562	435	Reco	rd des	tr'd	Same as 20.

Remarks: It was necessary to obtain a fresh stock of C. soft flour before lot 21 was made. Experiment showed it weaker than that first used.

Conclusion: The doubling of quantities and baking in quick succession showed necessity of further modification of milk proportion.

Experiment 5.

A final batch of bakings. The ingredients for each batch (except the milk) were weighed and kept carefully separate before any mixing was done. The mixing and baking were done as rapidly as possible. Nine biscuits of each flour were baked, when sufficiently cooled the best six of each were numbered and placed in a covered wooden box to prevent drying out before they were judged.

Baking No.	Flour.	Weight in grams of							Oven temp. Fr.	Per cent. loss in baking.
		Flour.	Butter.	Bak. Pow.	Milk.	Dough.	Biscuits. Raw.	Biscuits. Baked		
24.	A. Strong	300	24	16	252	592	308	257	450	16
25.	B. "	300	24	16	248	588	307	257	450	16
26.	C. Soft	300	24	16	212	552	323	260	450	19
27.	D. Blend	300	24	16	221	561	306	259	430	15
28.	E. 85% soft.....	300	24	16	222	562	302	257	450	14
29.	F. 35% "	300	24	16	218	558	295	247	450	16

Remarks: When strong and weak flours are made slack enough for biscuits and both are of the same slackness, the difference in "handling" quality is very noticeable. The strong flour dough has a stickiness like glue, while the soft flour has a silky smoothness which is much easier to handle.

When baked these biscuits are much alike in general appearance owing to the care taken in proportioning ingredients, maintaining oven temperature, and in manipulation; but the experimenter judged the first two about equal, C. soft rather better, 85% decidedly best, with 35% a close second.

The Dominion Millers' district meeting was held in Guelph, December 12th, 1907. One session was held in the O. A. C. Chemical Building about twelve hours after the biscuits were finished. All the numbered biscuits were carried over, the meeting informed of the uniformity of manipulation, quantities of flour, fat and baking powder, but not told the names of the flours or quantities of milk used, and the meeting asked to judge which were best. A committee of three was appointed, which reported numbers 28, and 29, as best, but declined to rank one above the other. The committee stated there was so little difference between the other lots that judgment between them was very difficult.

Conclusion: Soft wheat flours yield the tenderest biscuits when conditions are uniform.

Comparison of Cost.

The time of baking in the final experiment was about ten minutes for each lot, except lot 27, which took twelve minutes, but no exact record was kept. This calculation is therefore based upon the cost of raw materials only.

Cost of	A. Strong.	B. Strong.	C. Soft.	D. Blend, 20% B. 80% C.	E. 85% Soft.	F. 35% Soft.
Flour per cwt.	$3.20	$3.15	$2.10	$2.31	$2.50	$2.80
Butter, lb.	.30	.30	.30	.30	.30	.30
Baking powder, lb.	.53⅓	.53⅓	.53⅓	.53⅓	.53⅓	.53⅓
Milk, qt.	.04	.04	.04	.04	.04	.04
Flour used	.02119	.02086	.01390	.01529	.01655	.01854
Butter "	.01589	.01589	.01589	.01589	.01589	.01589
Baking Powder used	.01884	.01884	.01884	.01884	.01884	.01884
Milk used	.00931	.00916	.00783	.00816	.00820	.00805
Total cost material	.06543	.06475	.05646	.05811	.05948	.06132
Weight raw material (grs.)	592	588	552	561	562	558
Cost per lb.	.05006	.04988	.04633	.04692	.04794	.04977

Summary.

1. Other things being equal, soft wheat flours make tenderer milk biscuits than strong wheat flour.

2. Given a strong wheat flour dough and a soft wheat flour dough of equal slackness and suitable for milk biscuits, the soft wheat flour dough is the easier to handle.

3. At the present prices of the different flours the strong wheat flour biscuits cost more than soft wheat flour biscuits.

4. It is possible that a larger proportion of fat used with the strong wheat flour would yield biscuits of tenderness equal to those of soft wheat flour, but the cost of fat makes that method of improvement a disadvantage.

Recipients of Teachers' Certificate in Domestic Science.

A.—Graduates of the Two-year Normal Class :

Miss Irene Isabel Allan, Regina, Sask.
" Minnie Kent, Delhi, Ont.
Miss Eleanor Robertson, Toronto, Ont.
" Kathleen Vaughan, Brantford, Ont.

B.—Graduates of the One-year Normal Class :

Miss Arabella Bligh, Lakeville, N.S.
" Mary Helen Clowes, Toronto, Ont.
" Jennie Doak, Hamilton, Ont.
Miss Mildred R. McKee, Brandon, Man.
" Mossie B. Shepherd, Toronto, Ont.
" Christina L. Smyth, Toronto, Ont.

Recipients of the Housekeeper Certificate.

Miss Ada Hobbs, Guelph, Ont.
Miss Elizabeth Warner, Coulson, Ont.

Recipients of the Homemaker Diploma :

Miss Jean M Casey, Toronto, Ont.
" Marjorie Clark, Woodstock, Ont.
" Maud Davison, Cannington, Ont.
" Isabella Garland, Ottawa, Ont.
" Mary Hanna, Toronto, Ont.
" Molly Mungall, Milltown, N.B.
Miss Jessie B. Murray, Avening, Ont.
" Gladys Newberry, Hamilton, Ont.
" Barbara Palmer, Woodstock, Ont.
" Eva Tweddle, Fruitland, Ont.
" Lillian Wyckoff, Tyrrell, Ont.

Summary of Attendance.

A.—January to June, completing the College year of 1907-1908.
Normal Students : 23
Two Year Seniors, 4 ; One Year Seniors, 6 ; Juniors, 13.
Housekeeper Students : 9
Seniors, 4 ; Juniors. 5.
Homemaker Students ; 24
One Year, 21 ; Two Year, 3.
Short Course in Domestic Science : 69
Winter Term, 48 ; Spring Term, 21.
Short Course in Sewing (Held in Spring Term only) 9
Optional Students : 23
Six Months, 4 ; Three Months. 19.
Public and High School Students : 72

B.—Summer Course in Domestic Science 12

C.—September to December, opening the College Year of 1908-1909.
Normal Students : 37
Two Year Seniors, 12 ; One Year Seniors, 5 ; Juniors, 20.
Housekeeper Students : 15
Seniors, 7 ; Juniors, 8.
Homemaker Students : 37
Two Year, 5 ; One Year, 32.
Short Course in Domestic Science 25
Short Course in Sewing 11
Special Students in Dietetics 3
Optional Students 4
Public and High School Class Students 68

Total 441

D.—Students counted on both lists :
In Two Year Courses, ... 14
In Public and High School Classes 13

Total 27

E.—Total Number of Students in 1908 414

F.—Increase in attendance over 1907 47

Staff Changes.

Miss Givin was absent from January until June owing to illness. During her absence Miss Allan took the bulk of her classes, and Miss Ethel Gromitt, a graduate of an English school, took Miss Allan's work in Laundry.

Owing to the increasing pressure of students in September, Miss Nealina Macmillan was engaged to supervise the house-practice work. The work is now well looked after and we hope the arrangement will become a permanent one.

Equipment, Etc.

Up to September last the house-practice work had no headquarters. As the students increased and the kitchens and laundry were seldom out of use, this became very inconvenient. We have now gathered all the necessary apparatus into one of the rooms vacated by the Manual Training department and installed a couple of laundry tubs there. The irritating congestion of the other rooms is relieved, and the work runs smoothly.

The new automatic clock is a great addition to our equipment. It rings all bells needed for changing classes, assemblies, meal hours, etc., and needs no attention from anyone.

Macdonald Institute, with little more equipment, can accommodate many more students than at present. Greatly increased attendance, however, cannot be expected until Macdonald Hall is enlarged. Few parents wish their young daughters to board down town. Several applications were refused on this account last January; more were turned away in September; and by November tenth every room in Macdonald Hall was engaged for next January, in spite of the fact that foreign and optional students were ruled out.

Reference to the summary of attendance shows that the number of long course students is steadily increasing. It would therefore seem wise to begin thinking about and planning for extension of the residence building. Present conditions indicate that it will be needed long before it is accomplished.

I beg to acknowledge the efficient work of the other members of the Home Economics staff, and the valuable help given this department by many of the other departments.

MARY URIE WATSON.

PART XIX.

THE PROFESSOR OF FARM MECHANICS AND MANUAL TRAINING.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to present herewith my fifth annual report on the work of the department of Farm Mechanics and Manual Training, for the year 1908.

Since making my last report I have had the opportunity of attending a convention of the professors and instructors in farm mechanics and agricultural engineering in the leading Agricultural Colleges of the United States. This, their first convention, was held on December 27th and 28th, at Madison, Wis., in the building of Farm Mechanics of the University. The deliberations on how to improve and carry on this work proved useful and profitable. The first meeting was devoted to the formation of a permanent organization, and representatives from various colleges in the Union were elected to put the constitution in operation. The next convention is to be held during the winter vacation at Urbana, Illinois, when I hope I shall again have the pleasure of attending. These conventions cannot help but prove of great service to those engaged in the teaching of this subject. The following papers were read and discussed:—

"The Courses of Agricultural Engineering That Should be Offered," by Prof. Howard W. Riley, of Cornell.

"Shop Courses for Agricultural Students," by Prof. Wm. Boss, of Minnesota.

"Instruction in the Use of Cement and Concrete," by Prof. Ocock, of Wisconsin.

"Instruction in Farm Machinery," by Prof. L. W. Chase, of Nebraska.

"Teaching a Course in Farm Motors," by Prof. Rose, of North Dakota.

"A Course in Rural Architecture on Farm Buildings," by Prof. F. R. Crane, of Illinois.

"Agricultural Literature," by Prof. W. M. Hummell, of Colorado.

Addresses were also given by B. B. Clarke, editor of the *American Thresherman and Gas Review*, Madison, on "The Importance of Traction Engineers Having Proper Education," and by R. R. Teele, of the Department of Agriculture, Washington, D.C., on "Irrigation Drainage Investigations."

INSTRUCTION.

Winter Term. Commencing with the Winter Term of 1908, we had 120 First Year students in Woodworking and Drawing. This large number necessitated a division into six classes. It is to be noted here that this division reduces the time to three hours per week in the combined subjects. When it is stated that the students of these subjects in the States spend from 50 to 60 hours per term in these branches, as compared with our 39 per term, it will be readily admitted that we are labouring under some disadvantages. It is to be wished that facilities can be discovered by which more

time could be devoted to the subjects, especially when it has to be given up at the time when the student is beginning to receive the greatest benefit and to see its application to his life work.

Spring Term. Eighteen students taking the Household Science Course at the Macdonald Institute were given instruction in Applied Art in Wood and Metal work to amplify the courses given at the Institute. During the spring term sixteen pupils attended the various Optional Courses. In addition to these, eleven students were given lectures and practical demonstrations in Color and Household Decorations.

Summer School. By arrangement with the Education Department, a Summer School for Public School teachers was held from July 2nd to 27th. The following courses were offered:—

Course I.—Cardboard and Art.

Course II.—Woodworking.

For Constructive Work and Art, eight students registered. In Woodworking and allied subjects, nine were enrolled. These were:—

Course I:

Burke, Miss A. M., Belleville.
Dickinson, Miss F. L., Toronto.
Fair, Miss Becca, Millbrook.
Fee, Miss Henrietta, St. Catharines.
James, Miss Ada, Belleville.
Smith, Miss L. E., Brantford.
Parsons, Miss Marion, Goderich.
English, Miss Edith, Kingston.

Course II:

Chambers, J. E., Guelph.
Flumerfelt, W. M., Guelph.
Ingram, H. L., Belleville.
Long, Miss M., Brantford.
Plummer, Miss M., Wabash, Ind.
McConnell, E. D., Bancroft.
Wilcox, A. E., Stoney Creek.
Hutton, A. E., Edmonton, Alta.
Slaughter, J., Toronto.

The instruction in Art and Constructive Work was given by Miss Jennie Grier, of Port Arthur, a former student of Macdonald Institute. Attending this class were also twenty-six students from the Nature Study Course.

Farm Carpentry. Instruction was given to thirteen students taking the course in Elementary Agriculture.

Fall Term. The fall term opened with ninety Second Year boys taking bench-work in metal, forging, farm mechanics. These were formed into three divisions and we were most ably assisted by Mr. R. W. Wade, B.S.A., Lecturer in Animal Husbandry, and occasionally by Mr. Douglass, Farm foreman.

We consider this subject of the greatest import in the education of the future farmer, and the utmost care is taken in arranging laboratory exercises, in order that the vital points of each machine may be thoroughly understood. If a student has this knowledge, much time may be often saved by being able to carry out small repairs and to secure the effective working of the machine. Laboratory sheets are prepared, dealing with each implement and machine, of which the following are typical:—

Cultivator.

(*a*) 1. Name of cultivator? 2. Manufacturer's name?
3. Where made? 4. Price? 5. Single or double row?
6. Riding, walking, or combined?
7. Has the cultivator an expanding axle?
8. If so, how is the width changed?
9. What is the narrowest and widest width (centre of tire to centre of tire)?
10. Can axle be reversed?
11. Is the change difficult or hard to make?
12. How are the rigs spread?
13. Are the shovels straight or curved?

14. Are the couplings of the beans flexible and yet without lost motion?
15. Is there any provision for taking up the wear in the couplings?
16. Are you aided in lifting the rigs by a spring?
17. If so, where is the life spring located?
18. Can the tension of this spring be varied?
19. Does spring release when gang is up?
20. Will the spring hold the shovels in the ground?
21. Is the balancing automatic, by lever, or by gears?
22. Can the lifting lever be easily worked from the seat?
23. Can the rigs be forced into the ground?
24. Has the cultivator pivotal wheels?
25. What is the height of wheels?
26. What is the width of tire?
27. What is the shape of section of tire?
28. Have the wheels closed wheel boxes?
29. Have the wheels hard oilers?
30. If the cultivator has a seat what kind is it (hammock or straddle)?
31. Is it adjustable as to height and position?
32. Has the cultivator a spread arch?
33. Are singletrees attached so that pull carries tongue?
34. How are the rigs shifted?
35. Can the rigs be raised independent of each other?
36. If two rows, how is the adjustment made for width of row?
37. Will cultivator pass over large corn?
38. How is the height of hitch regulated?
39. Has the cultivator a foot pedal for guiding?
40. Has the cultivator a foot lift?
41. How far is it from the hitch back to the front shovel?
42. How much clearance do you find under the beams?
43. How is the pitch of the shovels regulated?
44. What is the distance between the shovels?
45. Can you change the number of shovels without changing the rigs?
46. What kind of shields has the cultivator?
47. Can the shields be combined in any way?

(*b*) 1. Why are inside shovels in front?

2. Can you cultivate nearer end of rows with pivotal cultivator than with the stiff one?

3. Explain your answer.

Sulky or Gang Plow.

(*a*) 1. Name of plow? 2. Manufacturer's name? 3. Where made?
4. Price? 5. Size? 6. Class of bottom (breaker, general purpose or stubble)?
7. Is the plow a high lift?
8. Frame or frameless? 9. Tongue or tongueless?
10. Is the plow drawn from beam or frame?
11. Has the plow a foot life?
12. Can the plow be made to float on stony ground?
13. Have the wheels enclosed wheel boxes?
14. Have the wheels hard rollers?
15. Are the wheels handy for greasing?
16. What is the height of hitch above floor, plow on floor?
17. Put a straight edge along the landside, and measure how far the furrow wheel is set over.
18. Has the plow any provision for adjusting the amount the rear wheel is set over.
19. Measure how much the keel of the landside lacks of touching the floor when the point of the share is on the floor and wheels are blocked up to the depth of the furrow.
20. Has the plow any provision for adjusting the amount of suction?
21. How high will the plow lift?
22. Will the plow make as good a right hand corner as a left hand?
23. On what side of shin is reinforcement?
24. Do wheels have boxings?
25. Does frame seem to be heavy or light as compared to other frames?
26. Can landside be removed?

(*b*) 1. What are the bails of a plow?
2. What is meant by load in the wheels?
3. Why are the furrow wheels inclined?

4. Why are the rear furrow wheels set outside of the line of the landside?
5. Should landside bear against earth as plow passes along?
6. How far should a rolling coulter be set outside the line of the landside?
7. By how much should a rolling coulter clear the shin of the plow?
8. What is the best plow in your estimation? Why?

Manure Spreader.

(*a*) 1. Name of spreader? 2. Manufacturer's name?
3. Where made? 4. Do the wheels track?
5. What advantages in a short front axle?
6. What advantages in a long front axle?
7. Will front wheels turn under bed?
8. Are front trucks well fastened?
9. Has machine an endless apron?
10. If return apron, does it return by hand or power?
11. Will cylinder clean apron thoroughly?
12. What system of mechanism is there for driving the apron?
13. How is the apron carried?
14. What device is there for breaking chunks?
15. Where is this device located with regard to cylinder?
16. How many levers has the machine?
17. Where is the lever for throwing the cylinder into gear located?
18. Where is the apron lever located?
19. If there is a reverse lever, where is it located?
20. Is the apron, chain or gear drive?
21. Is the cylinder chain or gear drive?
22. Where is cylinder in and out gearing located?
23. Is it accessible for repairs?
24. What is the style of mechanism for changing the speed of apron?
25. Can the feed be thrown out of gear and still permit the cylinder to run?
26. What is the shape of the cylinder teeth?
27. Will the machine spread wider than the bed?
28. What is height of bed?
29. What is height of driving wheels?
30. What is width of tire on same?
31. Does cylinder throw fertilizer over or under?
32. Which moves horizontally, cylinder or apron?
33. Which do you say will have the lightest draft, a machine moving the load to cylinder, or one moving cylinder to load?
34. Is there a drill attachment?

During this term thirteen pupils from Macdonald Institute attended the Course in simple Carpentry and eleven were present in the Colour Work.

Addresses and Writings.

In the course of the year the following articles were prepared by me for the Press at request of the editors:—

O. A. C. Review, "Future Power of the Farm."

O. A. C. Review, "Conditions Governing Location of Farm Buildings."

Canadian Dairyman and Farmer, "Choosing a Farm Power."

Canadian Thresherman and Farmer, "Power on the Farm."

I also addressed the convention of the teachers of Victoria County in the Woodworking Room of Machinery Hall on "Relation of the Grade Teacher to Handwork."

I attended the Convention of the teachers of Waterloo County, held at the Collegiate Institute, in Berlin, and spoke on "Educational Values of Handwork."

Mr. Kendall contributed an article to the *O. A. C. Review* on "Farm Workshop."

Choosing a Farm Power.

In view of the growing interest in farm power, I give the text of the article on "Choosing a Farm Power."

In the daily round and common task of the farmer, much of the hard routine work now done by manual labor could be as efficiently and economically performed by some mechanical contrivance,, as by sheer brute force of the hired man. Now that high price labour is scarce and extremely difficult to secure, every thoughtful farmer is contemplating how best to meet the situation so as to release somewhat the tension and strain of the strenuous life of the present day on the farm. Naturally his thoughts turn in the direction of installing some mechanical equipment to perform the heavy humdrum work, and the question that troubles him sorely is what is the best "rig" to instal to advantage, not only at the pump or feed grinder, but also at the wash-tub, churn and separator. To the average farmer who is forced by circumstances to contemplate something seriously along this line, and who has had comparatively little or no opportunity of seeing the different kinds of motive power, and the methods generally adopted to apply them to all sorts of farm operations, the problems of selecting the right mechanical outfit which will meet all his requirements most satisfactorily, is a vital and a perplexing one.

There are two types of engines on the market—the two-stroke cycle and the four-stroke cycle. The operations taking place in the cylinder to produce continuous power are similar in principle and character in each type and effect the same results, but the method of control is different. In a two-cycle engine there is an impulse or explosion for every second stroke of the piston, while the four cycle has four single strokes of the piston for every explosion. It is evident that given the same size, weight and strength of engine parts the engine operating with the greatest proportion of working strokes will develop the most power, so that the two cycle engine has a decided advantage on this score, but owing to its later development and its various mechanical difficulties yet to be overcome, it has not met with success like the four cycle principle, which better meets the requirements of power users, and manufacturers do not care to leave a ready market to perfect the two cycle problem. One of the weighty points for consideration is the horse power of the engine most suitable for farm work, but different localities are engaged in widely different kinds of farming. It is therefore impossible to arbitrarily say that a certain horse power will adequately meet all demands, say, of a hundred acre farm. The work to be done by the engine, of course, depends entirely upon the size and capacity of the machines to be driven, and since in the diversity of farming practised a very wide range of machinery exists, it is necessary, in order to help the farming community at large, to have some basis on which to determine to one's own satisfaction what horsepower is best to buy. It is by no means economy to have a rated horse power very much higher than is actually needed to perform the work in hand. Of course there is no engine built that will last as long if it is run to the limit of its capacity all the time. There should be a reasonable allowance. A gasoline engine reaches its maxim horse power when the governor is not acting. To determine the horse power required, a fair basis would be that the horse power of the motor should be equal to that required by the largest machine driven, plus 25 to 50 per cent. of the power necessary to drive the other machines—25 per cent. when the machines need not be driven at the same time, and 50 per cent. when several machines are to be driven simultaneously with the largest one. This rule can be successfully applied to average farm conditions.

To drive the various small farm machines, such as a cream separator, with a capacity of from 500 to 700 pounds of milk per hour, requires 1/5 horse power. A pump lifting about 20 gallons of water per minute from a well 50 feet deep would need about ½ h.p., based on a pump efficiency of 50 per cent. Churns, washing machines, fanning mills, grindstones, each requires about 1/10 horse power to drive them under load. A bone cutter requires about ¼ horse power, if not crowded. A hand drill, depending upon size of the holes drilled and the speed, would need from 1/10 to 1/3 horse power. These machines include practically all of the smaller machines in use on one or the other of the various kinds of farms. The total power required for all of them amounts to 1½ horse power.

The feed grinder will require from 1 to 1½ horse power, depending, of course, upon the capacity, speed of the mill, condition and kind of grain, and the fineness desired.

A saw rig could be operated by a 2 horse power, although with a 3 horse power a great deal more work can be accomplished in a given time. Assuming, then, that a farmer wishes to purchase an engine to run all these machines, we find that the horse power of the motor, according to our formula, should be as follows:

The largest machine, the saw, requires 2 horse power, the grinder and the others 1½ horse power, and small machines 1½ horse power—total, 3 horse power, 25 per cent. of which is ¾ horse power. Then 2 h.p., plus ¾ h.p., equals 2¾ h.p., the amount at which the engine should be rated. This 3 horse power engine would develop sufficient energy to drive the saw at limited capacity and many smaller machines simultaneously. Many farmers find that a 4 horse power engine is an excellent size, for besides operating all the small machines enumerated, it will, in addition, drive a feed mill with a capacity of about 20 bushels per hour. Usually this takes about 3 horse power to accomplish the work.

The large engine, however, has its place where heavy class of work like threshing, filling silos, etc., has to be done. But the question arises, has the average farmer enough of this work to justify him in investing in a large engine, or would it be cheaper to hire some one making a specialty of that class of work to do it? Should the work warrant a large engine, have it large enough to handle the work successfully; indeed it should be so large that it would be good economy to have two—a small one, which could be moved from place to place for the light work, and a larger one.

Practically all the standard makes of the four cycle engines are designed to take into the cylinder at each suction stroke, the largest possible quantity of the explosive mixture that can be taken in by suction. Then this charge of fuel, as it is often called, is subjected to a compression somewhere between 40 and 90 pounds per square inch by the returning piston. On exploding, this compressed charge gives forth a working force of nearly four times as great as the pressure of the gas at the point of exploding. Hence two engines of like bore and stroke, running at the same speed, would each consume very much the same quantity of explosive fuel, if working under full load. But an engine having only, say, 40 pounds compression pressure, develops only half as much power as one under 80 pounds, so that the former would be wasting half its fuel, or, in other words, would require twice as much fuel per horse power as the latter engine.

It is surprising what a difference there is in engines in this respect, and the economy in fuel should be looked into carefully. Tests demonstrate that low compression engines are "gasoline wasters." High compression engines, about 85 pounds to the square inch, give the best results. The smaller the

horse power of the engine, the more it will use relatively, and the best engine on the market will not get much, if any, under a gallon a horse power for 10 hours run under full load, despite the claims of manufacturers.

If there is a difference in engines in this respect, there is, of course, a cause for it, and if so, what is it? To an economical engine a good compression, a good mixing and a good sparker, proportionately timed, are absolutely essential. The first we have discussed. We shall now briefly deal with the remaining two. The nearer the mixture of air and gasoline approaches to a perfect gas, the higher the efficiency of the engine. It is generally considered that a proper mixture consists of one part gasoline to seven parts of air. Choose an engine with the mixer located near the head and requiring no regulation of the air. An engine drawing its charge through a long pipe is a hard starter, especially in cold weather. A small glass reservoir on the mixer saves much annoyance, as one is able to see if the pump is acting, the tank empty, or water in the gasoline. Next come the methods of ignition, the hot tube and the electric spark. The former is all but obsolete; the latter is divided into two kinds, jump and touch spark. Generally speaking, jump spark has been adopted for high speed engines, the touch for slower speed power purpose engines. The jump spark has the advantage of no mechanical moving parts, and is subjected to a little wider variation of the ignition point and is usually run with dry cell batteries. The touch spark is mechanically operated. The spark is produced by snapping a pair of contact points. As these points are separated after completing the electric circuit, there is produced a bright spark.

The power of the ignition greatly influences the consumption of fuel, which may be reduced from 25 to 30 per cent. in a given horse power by using the proper quality of apparatus. There should be some simple method of timing the spark. This is very essential, as the explosion should take place just before the piston reaches the farthest point back. The greater the speed of an engine, the more advance on the spark. This should be regulated so as to throw it past the centre for starting.

Avoid high speed engines for power purposes; the race horse is all right on the track but cuts a poor figure at the plow.

A Traction Engine for the Farm.

In my last report I offered some remarks on the need of a useful, light tractor for farm purposes. Since that time the first agricultural motor contest ever held in North America was carried out at the Winnipeg Industrial Exhibition during the week of July 11-17, amidst a concourse of interested farmers. An abridged account of the trials, taken from the report of Mr. E. W. Hamilton, of Winnipeg, is appended:—

This contest was widely advertised in local and foreign parts. The following manufacturers responded willingly, sparing neither time nor expense to give the public a complete demonstration of what the gas tractor will do when applied to farm power work:—

Marshall & Sons Co., Ltd., Gainsborough, England, a 30 horse power, two cylinder tractor.

Transit Thresher Co., Minneapolis, Minn., a 35 horse power, four cylinder tractor.

The International Harvester Co., 15 horse power; 20 horse power one cylinder tractors, and a 40 horse power three cylinder tractor.

The Universal Motor Co., Regina, a 20 horse power four cylinder motor.

According to the rules and conditions laid down by the Exhibition Association, all engines had to be officially weighed.

The contest was arranged to:—

First.—Pull a load of sand and gravel in proportion to the rated horse power of the engine over a 2,999 feet course, measured by the City Engineer Department, for a period of two hours, the engine lapping the course as many times as possible.

Second.—Plow with as many plows as each tractor could draw in tough gumbo for a period of two hours.

Third.—The construction of the different machines as applicable to the needs of the farmer.

The first start in the haulage test was made by the International Harvester Co.'s 20 horse power engine over a course that was anything but macadam, made up of rough prairie sod for the greater part, interspersed with patches of loose gravel. This gravel was what determined the size of the load and the tractability of the engines. The 20 horse power International, which started with two wagons and a load of 18,940 pounds, was obliged to drop one wagon when an unusually large piece of gravel was reached. The Transit Thresher Co.'s motor, which began with three loads aggregating 30,030 pounds, cut off one wagon for the same reason, reducing the load 18,040 pounds. The others took warning, and started with loads which they were sure of hauling. The International 20 horse power made eleven laps and the Transit Thresher engine five. The steering chains of this engine broke, delaying it considerably and thus accounting for the small number of laps made. Nevertheless it made excellent time during the last laps. The third motor starting was the International Co.'s 15 horse power, hauling a load of 9,150 pounds. It made a run of ten rounds in 116 minutes, using 31.5 pints of gasoline.

The next to take the track was the Kinnard-Haines 30 horse power, four cylinder tractor, finishing with a load of 18,040 pounds, making nine laps in 120 minutes, and using only 48 pints of gasoline for the entire two hours.

Marshall & Sons Co.'s 30 horse power, two cylinder tractor lapped the course eleven times in 121 minutes. It was a beautiful run and the little English machine attracted much attention.

The International Co.'s 40 horse power, three cylinder, hauling a load of 9,150 pounds, made a record time of eleven rounds in 116 minutes.

The Universal 20 horse power, four cylinder tractor came next with a load of 9,540 pounds, but an unfortunate break-down did not permit it to finish the first lap, and accordingly was withdrawn from the contest.

In every case the judges, who were Prof. A. R. Craig, of the Manitoba Agricultural College, and Mr. William Cross, of the Mechanical Department of the C. P. R., carefully measured both water and gasoline at the start of the haulage run and measured the unused portion at the finish, in order that each machine might be judged as to fuel and water economy.

The ploughing field consisted of good old Manitoba gumbo, which was just about as hard a class of soil for any plow to negotiate as can be found anywhere on Mother Earth, Heavy rain has somewhat softened it, however, reducing the draft per fourteen inch furrow from 900 to 650 pounds, a dynamometer test having been made on the same ground the Saturday previous.

The lands had been previously laid out and measured by the Cockshutt Plow Company, who furnished all of the plows for the occasion and experts to handle them as well. They were all of the fourteen-inch size and of the solid gang type, and it must be said did beautiful work in every case.

The International Harvester Co.'s 20 horse power made the first start in the plowing test, drawing three plows, and in its allotted time of two hours, turned 2.042 acres.

The 15 horse power of the same company, with three bottom gang attached plowed 1.795 acres, consuming 2.3 gallons of gasoline per acre.

Next in order was the Transit four cylinder motor, with its eight foot drive wheels and a patent steering device, pulling six plows. Some very nice work was done with this engine on the 2.957 acres which it plowed.

The Marshall two cylinder motor drawing three bottoms and burning kerosene made a very creditable test.

The 40 horse power, three cylinder International Harvester Company tractor was next hitched on to five bottoms, and in two hours plowed 2.847 acres. This engine turned an acre in forty-two minutes on 2.86 gallons of gasoline.

The last engine to tackle the plowing was the Kinnard-Haines four cylinder motor with a load of six furrows, and with the exception of one minor stop, the run was errorless. It completed 3.24 acres in one minute over the two hours, 2.5 gallons of gasoline per acre being the fuel consumption.

As the construction of any farm tool is of vital importance to the farmer, the judges spent considerable time inspecting the working parts and watching the ease with which they could be manipulated. They then carefully arranged their data on the basis of 155 points, calculated as follows:—

	Points.		Points.
Gasoline consumed	20	Manipulation	10
Haulage per horse power	15	Clearance of parts from ground	10
Distance run without replenishing gasoline	5	Steadiness of running	10
Distance run without replenishing water	5	Acres ploughed per unit of gasoline	10
Turning facilities	10	Acres ploughed per minute	15
Protection from mud and dust	5	Price f.o.b. Winnipeg, per lbs. weight	10
Accessibility	10	Total	155
Speeds	10		

When the final results were announced, it was found that the Kinnard-Haines tractor had carried off the first prize gold medal honours, with 117.6 points. The International Harvester Co.'s 15 horse power motor came second, with 117 points, and was declared the silved medal winner. Marshall & Sons, Gainesborough, England, took third honours and the bronze medal, with 108.3 points. The other tractors in order were credited as follows:—

International Harvester Co., 40 horse power, 107.7; Transit Thresher Co., 35 horse power, 103.3; International Harvester Co., 20 horse power, 101.5.

It is a large problem, this one of farm power, for the farmer to solve, and contests of this nature help materially to find a solution.

Three Months' Course for Teachers.

At the request of the Education Department, received through you, I have drafted a course of elementary industrial training to be given to public school teachers during the Spring Term.

This course of study is intended to be suggestive, rather than a prescribed one suitable for all grades of schools and conditions. The student is not given a set of exercises to be carried out rigidly, according to the needs of special "forms" in the schools; but more particularly trained to exercise thought and judgment, and to develop individuality and originality. It cannot too often be repeated, that the purpose of the work is not primarily industrial, but educational, for, when properly carried out, this course will not only train muscle and develop skill in manipulation of various tools and materials, but through muscular or motor training, be productive of superior intellectual and moral fibre. Great stress is laid on Drawing, Constructive Design and Construction. "Every workman should, for the most part, be able to conceive clearly and accurately in his own mind the shape of everything he may have to make, or work with. This makes it the first condition of skill that he should master shape in his own mind, and that mastery requires him to be a geometer."

The student is made acquainted, as far as possible, with the conditions that governs the industrial phases of education, and their application to Public School conditions; and so he gains experience that will prove of inestimable service to him, when thrown upon his own resources. The examples and exercises used must all be taken as illustrating principles, and not "a cut and dried" scheme designed to meet the requirements of every locality. Indeed, it may be said, that the measure of usefulness and success attained at this course, especially from an educational point of view, will be in a direct ratio to the degree in which the student puts *himself* into the work, for the scheme furnishes sufficient material from which, by selection and evolution, it will be possible to arrange a practical course suitable for any school or district.

Students should bring with them any good manuals they may have on the subjects of the course. All should procure a sheet of carbon paper, tracing paper, and a supply of drawing paper (unglazed), a set of Reeve's water colour No. 50A, a box of crayons, a few sticks of charcoal, Japanese brush No. 15, a water cup, a set of good drawing instruments, and from three to five H. pencils. These may, however, be bought from the supply houses in Guelph.

Visits will be made to local schools to study equipment, organization, etc., and to local industries for observation of processes.

Time Table.

	Subject.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
8.45 to 9.45	Drawing..	P. & S. Geometry.	Working Drawing.	Design.....	P. & S. Geometry.	Working Drawing.	Design Construction.
9.45 to 12.00	Practical work.	Wood working	Metal working.	Wood working.	Metal working.	Wood working.	Metal working.
1.30 to 4.00	Constructive work.	Paper folding Cardboard Basketry.	Colour work.		Clay modelling. Weaving.	1.30–2.30 Blackboard drawing. 2.30–4.00 Planning schemes.	

(*a*) *Constructive Work*: The general principles underlying the whole of this work are, the gaining of knowledge through the general and combined activity of the mind and the senses, that is, through doing, in its widest and most general sense; the making of new forms and combinations, the giving of definite expression to ideas and mental images; the rendering of the inner outer, is the great Froebelian doctrine of creativeness.

Paper folding, cutting and mounting.
Simple designing—paper applique.
Cardboard work—thin and thick boards.
Modelling—clay and sand, and papier maché.
Weaving—Raffia, rattan, rush, and yarns.
Basketry—Woven, coiled, and sewed.
Simple book-binding.
Planning schemes suitable to the children's interests and abilities.

Books of Reference:

Primary Handwork—Seegmiller.
Correlated Handwork—Trybom and Heller.
Cardboard Construction—Trybom.
Paper and Cardboard Construction—A. H. Chamberlain.
Story Telling with the Scissors—M. H. Beckwith.
Occupations for little fingers—Sage and Cooley.
Clay Modelling—Holland.
Clay Modelling—Unwin.
Handloom Weaving—M. P. Todd.
Practical and Artistic Basketry—L. R. Tinsley.

(*b*) *Wood Working*: Presents a comprehensive view of Manual Training. The bench work aims to inculcate principles emphasizing general lines and proportions, construction, decoration, and the reason for doing work in the particular way, which is the result of practical constructive experience. The work is embodied, as far as posisble, in complete finished articles. In this way the student acquires correct ideas of methods of construction, proportion, setting out, and general technique of the work.

Knowledge of the proportions of joints used in carpentry, joinery, and cabinet-making, and their correct application. Position of mortises with regard to the neutral axis. Calculation of quantity of lumber necessary for making the object. Estimation of cost of articles made. Fastenings—dowels, pins, cleats, keys, wedges, glue, screws and nails. Tools—their construction, care, use and sharpening. Analysis of the action of cutting tools; cutting angles, etc.

Agricultural Students at Work in the Blacksmith Shop.

Books of Reference:

Educational Woodworking—J. C. Park.
Problems in Woodworking—Murray.
Problems in Furniture Making—Crawshaw.
Beginning Woodwork—Van Deusen.
Elementary Sloyd and Whittling—Larsson.

Farm Carpentry: Has in view the need of students taking up Elementary Agriculture for simple carpentry, such as, making of tool handles, trays, stakes, crates; principles of framing; fastening; hinging; locks, etc.

Books of Reference:

Woodworking for Beginners—Wheeler.
Every Man's Own Mechanic—Spon.
Carpenters' and Joiners' Handbook.
Benchwork—Goss.

Metalworking: An effort is made to teach the fundamental principles of the work and to give such exercises as will best train the eye, quicken thought and develop self-reliance. Perhaps no form of manual training involves greater dexterity of hand, accuracy of eye, and quickness of thought than smith-work. The necessity of striking "while the iron is hot" is impressed at once upon the mind of the pupil; from the first simple exercise in "drawing out" he realizes that a moment's delay may result in a total failure, and that the necessity for keeping the mind on the alert, to meet the changing conditions of the thing in hand, becomes imperative; and instant judgment is brought continually into play.

Machine shop work includes chipping, filing, fitting, and finishing of work in cast iron, wrought iron and steel. Theory and practice in the grinding of cutting edge tools used in general machine shop practice; operation and use of lathes and drills. Screw cutting by hand and machine.

Art Metal Work consists of shaping, raising, and decorating simple forms in brass and copper.

Soldering, brazing, annealing, hardening, and tempering.

Forging exercises in drawing out, shaping, bending, upsetting, welding; construction of rings, chains, chisels, etc.

Books of Reference:

Principles of Fitting—Whittaker.
Metalworking—Pearson.
Forty Lessons in Engineering Workshop Practice—Mitchell and Davy.
Workshop Appliances—Shelley.
Forge Practice—Bacon.
Copper Work—Rose.

(*c*) *Drawing*: The aim of this course is to lead the child to appreciate the power in expression, to observe closely, and to discriminate values, which are involved in correct observation; to train hand and eye to co-operate with judgment; to test values in symbols, and to interpret by judgment the co-operation of hand and will in obedience.

Pencil crayon, charcoal, brush, water color and ink.

The structure and function of the brush in defining forms by their masses.

Colour schemes worked out from the colour view point, illustrating various harmonies.

The use of squares, triangles, and instruments.
Plane geometry, practical problems, lines, angles, and polygons.
Construction and use of plain scales.
Orthographic projections of solids—three or more views.
Cutting and oblique planes and sections.
Isometric projection.
Constructive Design.
Working Drawing.
Machine Drawing.
Tracing—Blue printing.

Books of Reference:

Bases of Design—Walter Crane.
Line and Form—Walter Crane.
Principles of Design—Batchelder.
Classroom Practice in Design—Haney.
Mechanical Drawing—Anthony.
Machine Drawing—Low.

In the Implement Room. Farmers' Boys Studying Farm Machines.

Finishing: The primary object is to give the student a knowledge of the various styles and methods of wood finishing without which, even the best constructed articles lose much of their beauty, refinement, and attraction. The main purpose is to impart an agreeable surface, colour, and texture to the wood and to preserve it.

Staining, fuming, filling, shellacing.
Oil and wax polishing.
Pigments, priming, coats.
Oils, driers, brushes.
Painting and glazing.

Books of Reference:

Polishes and Stains for Woods—Upcott Gill.
Natural Woods and How to Finish Them—Berry Bros.

Forestry, Lumber, Wood: In this connection an attempt is made to correlate with Nature Study Work. The pupils are taught how to recognize the common woods, the characteristics of good lumber, and the defects in wood; the influence of these, in planning and designing.

Forest preservation—propagation, time of cutting, pruning.
Trees—Classes, structure, growth, seasoning, shrinking, and warping.
Properties—Durability, elasticity, stiffness, density.
Varieties of common woods—peculiarities of each, colour, grain, identification.

Defects in lumber—Resin pockets, knots, shakes.
Decay and its causes—Preservation.
Lumbering, transportation, sawmills, grading widths.

Books of Reference:

Primer of Forestry—Pinchot.
Timber—Hasluck.
A First Book of Forestry—Rothe.

Theory and Practice: Manual Training as a factor in general education. History of Manual Training; the various systems, Russian, Sloyd: progress of Manual Training in Canada.

Books of Reference:

The Place of Industries in Elementary Education—Dopp.
School and Society—Dewey.
Education and the Larger Life—Henderson.
Theory of Educational Sloyd—Salomon.

Method of Teaching—Organizations, courses, equipment, plans, estimate of cost.

Books of Reference:

Economics of Manual Training—Rouillion.
Manual Training Made Serviceable to the School—Goetze.
Reports of Inspector of Technical Education.

In view of the facilities and inducements to be offered by the Education Department, it is fully expected that a large number of students will avail themselves of the benefits of the course. Students leaving us should have a wider view, and a greater appreciation of the immense influence they are calculated to exert on the industrial and agricultural outlook of their future pupils.

Thanks.

I cannot close this brief report without sincerely thanking, on behalf of the whole student body, those manufacturers who have generously donated specimens of their different machines and implements to the Department, and so facilitated and made more practicable our course of instruction

in Farm Mechanics. No student need now leave us without a knowledge of the general construction and effective use of a large number of implements usually employed in farm operation. The donators are: —

Massey Harris Co.

1 No. 5, 6 feet Binder, 3 horse.
1 No. 4, Carrier for No. 5.
1 No. 3, Hay Tedder, 2 horse, 6 feet fork, 2 prong.
1 No. 3, Cream Separator, 300 lbs.
No. 1 Side Delivery Rake, trees and yoke.
1 Hay Loader and Fore Carriage.
1 13 tooth Cultivator, No. 7 Standard Lever.
1 No. 3 Manure Spreader, 50 bush.
1 No. 4 Drill.
1 Broadcast attachment.
1 No. 8 Standard Disc Harrow, 16 inch.
1 No. 12, 20 Section Mower.
1 Binder attachment and stand.

Aspinwall Potato Machinery Co., Jackson, Michigan.

1 Potato Cutter.
1 Potato Planter.
1 Four Row Double Cylinder Sprayer.
1 Potato Sorter.

Gilson Manufacturing Co., Guelph.

1 2½ horse power Gasoline Engine.

The Champion Potato Machinery Co., Hammond, Ind.

1 Potato Digger.

Tolton Bros., Guelph.

3 Fork Sling Cars, mounted on tracks of steel, wood and rod.
1 Fork Car for wood track with horse for attachment.
1 double machine for Slicing and Pulping Roots.
1 Single Pulper.
1 Seed Harrow.
1 No. 8, 5 feet cut, Pea Harvester and Buncher.

J. Fleury & Sons, Aurora.

1 10-inch Grain Grinder.

Frost & Wood, Smith's Falls.

1 Horse Rake.
1 Gang Plow, straight and rolling coulters.
1 pair Sod Bottom.

Louden Machinery Co., Guelph.

Litter Carrier and track.
2 Forks with carrier and track.
2 Slings with carrier and track.
4 Stanchions.
4 Door Hangers.

The Templin Manufacturing Co., Fergus.

1 Fanning Mill.

Wilkinson Plough Co., Toronto.

1 No. 4 70-bushel Manure Spreader.
1 Climax "A" Mounted Ensilage, Straw Cutter.
1 Reversible Disc Plough.
1 No. 3 Plough, gauge and furrow wheels.
1 No. 4 Plough.
1 No. 5 Plough.
1 No. 7 Plough rigged with skim and wheel and with coulter and landside extra.
1 double mouldboard Drill Plough with potato digger attachment.
1 No. 1 Drag Scraper.
1 No. 3 Wheel Scraper.
1 Steel Tray Barrow.

Through the kindness of the Massey-Harris Co., I was enabled to spend about ten days at their factory in Toronto, visiting different departments, and taking part in the erection of the various implements that the firm manufactures for farm use.

The prize of twenty dollars, open to competition among the second year men only, for the best drawing of a barn, offered by the Louden Machinery Co., Guelph, was awarded equally between Messrs Snyder and Reek.

This year the second year students taking farm mechanics were taken through various factories devoted to the making of agricultural implements and machinery, to study and observe their operation and erection. We paid visits to, and had every facility offered us by, the following firms:

The Wilkinson Plough Co., Toronto.
The Fairbanks-Morse Co., Toronto.
The Massey-Harris Co., Toronto.

To these firms for their gracious reception and attention, and also to those who have donated implements and machinery, we tender our grateful thanks.

Permit me, in conclusion, to thank you for the cordial support and generous consideration in affording me facilities to acquire further and more detailed information respecting many branches of the work carried on by this department, and thus rendering the instruction given more effective in farm life.

I have the honour to be, Sir,

Your obedient servant,

JOHN EVANS.

Teachers' Gardens, 1908.

In the Marden School Garden, 1908.

PART XX.

THE PROFESSOR OF NATURE STUDY.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to submit my fourth annual report on the work of the Nature Study Department.

SUMMER CLASSES.

The work of the year 1908 was marked by a decided advance towards realizing one of the chief aims for which the Nature Study Department was organized. With the hearty concurrence and support of the Education Department the work was specially organized to meet the needs of the rural and village schools of the Province. While our work in Nature Study has always had a distinct agricultural bias, yet it was chiefly town and city teachers who took advantage of the instruction offered, and the work naturally was fitted to their requirements. This summer, however, a special course called Elementary Agriculture and Horticulture was commenced. It is specially adapted to rural school work and leads to a certificate qualifying for instruction in School Gardening.

A syllabus of study based on our experience with previous classes of teachers was prepared embracing practically every department of study in the science of Agriculture. It was practically the same outline as that printed in our report for 1907.

As the complete course is for a continuous three months' term or two summer sessions and a winter reading course, only part of the work outlined was covered this year. It was planned to bring every department of the College into co-operation in giving the teachers a broad view of the field of agricultural interests so that they might have a proper perspective in their view of agricultural education for the schools.

The draft of the time table indicates sufficiently the allotment of time for each subject and also how far the attempt to bring the work of the whole College into the general conception of agriculture was successful.

——	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
8.30–10.15.....	Physics.	Entomology	Physics.	Bacteriology or Animal Husbandry	Seminary Work.	Gardening
10.15-12.00.....	Botany.	Chemistry	Botany.	Field Husbandry.	Poultry or Dairy Husbandry.	
1.30–3.30	Farm Carpentry.	Horticulture.	Botany or Forestry.	Horticulture.	Gardening.	

It might appear that the course was overloaded with too many subjects and lacked in giving sufficient emphasis to the strictly so called agricultural and horticultural subjects. But there will always be a difficulty in an adjustment for this defect; some subjects will be over emphasized or under emphasized. In the general arrangement, Agriculture (Field Husbandry), Horticulture, Botany, Physics and Entomology have been provided for as *Major* subjects, and Chemistry, Bacteriology, Poultry, Dairying, Animal Husbandry and Manual Training as *Minor* subjects.

The course must be broad to make the most for the diverse needs of the country and the diverse capabilities and preferences of the teachers. As the selection of books for the reading course and the answer to our enquiries show, the teachers have found as much use for their instruction in Bacteriology, Poultry or Dairying as for that received in Botany or Agriculture for example. With very few exceptions our correspondents insist that they would not choose to have restriction on subjects. Some acknowledge that they received their greatest help in quite unexpected parts of the course which, if they had had an option, would have been untouched. They agree that more time would be an advantage, but realize that under the circumstances the arrangement for their instruction could not be much bettered. It is not possible to have the features of a long term of instruction in a short summer session. Many undesirable things must be submitted to.

The first class comprised the following students:

Miss Bertha Batchelor, Toronto; Miss H. L. Beardmore, Toronto; George Clayton, Gore Bay; Miss Lillian F. Furlong, Kennansville; Miss Ena Henderson, Underwood; Thos. J. Hicks, Selkirk; Miss Marian Langdon, Braemar; Miss Jane Lush, Sault Ste. Marie; Miss M. Vivien Martin, Hagersville; Miss Amy E. McKowan, Avonton; John A. MacDonald, Thamesford; D. A. McDonald, Hickson; George McMillan, B.A., Belleville; Miss Essie M. Sann, Mountain; Miss Mabel L. Stewart, St. Catharines; John R. Tuck, B.A., Brampton; Miss Louise Waterman, Bensfort; Miss Mary Yates, Toronto; John W. Yake, Drayton.

Messrs. McMillan and Tuck were High School science teachers, and Miss Yates a Women's Institute lecturer; Misses Beardmore and Batchelor were interested as gardeners. The remainder of the class were public school teachers.

Suggestion for Subsequent Years.

When this work was first arranged for it was planned to cover the course of instruction leading to the certificate in Elementary Agriculture and Horticulture in two summer terms. Our experience of the past summer suggests the advisability of a modification of the plan. It would be a difficult matter for our instructors to have to arrange two short courses for two separate classes of teachers. The demands of the Summer School already break in awkwardly on their other duties, and two classes would entail altogether too much digression from these.

I would propose, therefore, to make the course which we now call Nature Study the first or preliminary year in Agriculture. In this session the work in Horticulture, plant, seed and insect collecting, school gardening and in general the outdoor studies could be largely completed. This would make a good foundation for the second year's work and allow more time for practical instruction in laboratories and individual experimenting with plants in the gardens. Besides it would bring relief by reducing the number of subjects. Those teachers who have taken the work in Agriculture in 1908 could reverse the order and take the Nature Study in 1909.

Effect of the Summer's Course on the Teacher and Her Work.

Through correspondence in connection with the reading course, I have learned something of the benefits of the course to the teachers themselves and their use of the instruction in the classes in their schools. In reply to the question "Has your work as a teacher been changed in any way by your summer's work?" I have received replies from several such as the following:

"My summer's course has given me renewed interest and inspiration for this year's work. . . . . Agricultural subjects seem to crop up everywhere, especially in geography."

"Yes, I think my work has been changed; we now seem to look more for the *Agricultural* side. I find the instruction of use in all subjects."

"Although raised on a farm, I now look upon Agriculture in a different light. I see that to-day it is not only necessary that farmers should know "how," but that the "why" is a very important factor in success. I am more fully convinced than ever that a great amount of the work taught in the average public rural school is of little use, and that too often the boy is led in early life to scorn the farm and all its connections. I formerly taught Agriculture from a text book. I have ceased that, I hope, forever. . . . . I formerly taught it because I was obliged to, now because the pupils are too enthusiastic to let me miss a single lesson."

In reply to the question "What instruction have you been able to give to your pupils in Elementary Agriculture and Horticulture this fall?" I have received several interesting replies. The possibility and desirability of introducing the work into the schools is clearly indicated. One who teaches in a dairy district writes:

"Next week I am having a judging contest on a dairy cow, with my scholars. We use the regular score card used at Guelph, and the boys take great interest in the work. This is followed by oral and written language lessons on 'An Ideal Dairy Cow.'"

Another who teaches in a country where general farming obtains writes:

"I have given instruction this fall in preparing soil, drainage, and the planting of bulbs. A number of pupils have begun growing hyacinths and tulips of their own; have given illustrated lessons on budding; have had a series of very interesting lessons on the 'Care of Milk for Home and for Creamery Use.' The subject of bacteriology was especially helpful here. Have had a number of collections of weed seeds made; have succeeded in making most of my pupils acquainted with many common weeds in this locality."

Another writes:

"We have been following Mr. Dearness' course in the *School and Home*; lessons on corn, birds, seed dispersion, weed seed collecting and tree seeds with the third class . . . . I find, however, that indirect, informal instruction in Agriculture comes in almost everywhere and a few words to a group of children may mean more than a cut and dried lesson to all."

Another teacher replies:

"My work this fall in Agriculture has been on the following subjects: Soil bacteria, identification of common farm weeds found in this vicinity by sight and by seed. Nature Study is brought into nearly all my other subjects also."

The Winter Reading Course.

At the close of the July session a consultation was held with the teachers to make a selection of books for winter reading. It was realized that the instruction of the summer was taken in that condensed and hurried

manner inseparable from short courses and that the work would be made more effective by a short course of supplementary reading. In addition to the class in Elementary Agriculture, nine of the class in Nature Study joined. There was some difficulty in choosing books that met the wishes and needs of the whole class as the field is wide and the number of texts large. We were desirous moreover to keep the selection small so that no one would feel this part of their instruction a burdensome task.

The course arranged for 1908-09 is as follows:

(1) For October and November—"Nature Study and Life"—Hodge.

(2) For December—"Story of the Plants"—Grant Allen.

(3) For January—"Chemistry of the Farm"—Warrington.

(4) For February—"The Soil"—King.

(5) For March—"Canadian Dairying"—Dean.

(6) For April—"First Lessons in Poultry Keeping."

(7) For May and June—"Botany"—"An Elementary Text Book"—Bailey.

The plan adopted for making this branch of the work effective is that of the "Correspondence School." Towards the end of November a circular letter was sent out with questions on the first text. The replies have been satisfactory and go to show the possibilities of this line of instruction in influencing the teaching in the schools of those concerns of the people met with in their every day labours or recreations.

The first letter dealing with the reading of Hodge's *"Nature Study and Life"* is given here to indicate our aims and method.

Dear Madam,—By this time, I presume, you have made an acquaintance with Hodge's *Nature Study and Life* as the first text of our Winter Reading Course.

I shall be pleased to receive from you at your convenience answers—and they may be as brief as you will—to the questions submitted below. Please do not look upon them as a dreadful "quiz" to find out what you do not know, but rather as a chance to give expression to some of your conclusions regarding Nature Study.

Please write the answers in ink on foolscap paper.

With best respects,

Yours very truly,

S. B. McCready.

1. What plan did you follow in reading the book?

2. Have you noticed whether it has influenced your work or your attitude to your work as a teacher?

3. Have you made any use of any particular part of it in your classes? If you have, please state what the topics were.

4. Where does the country boy or girl come in, in his schemes of Nature Study? Could you suggest any topics that should be treated of if the book were to be made of wider scope?

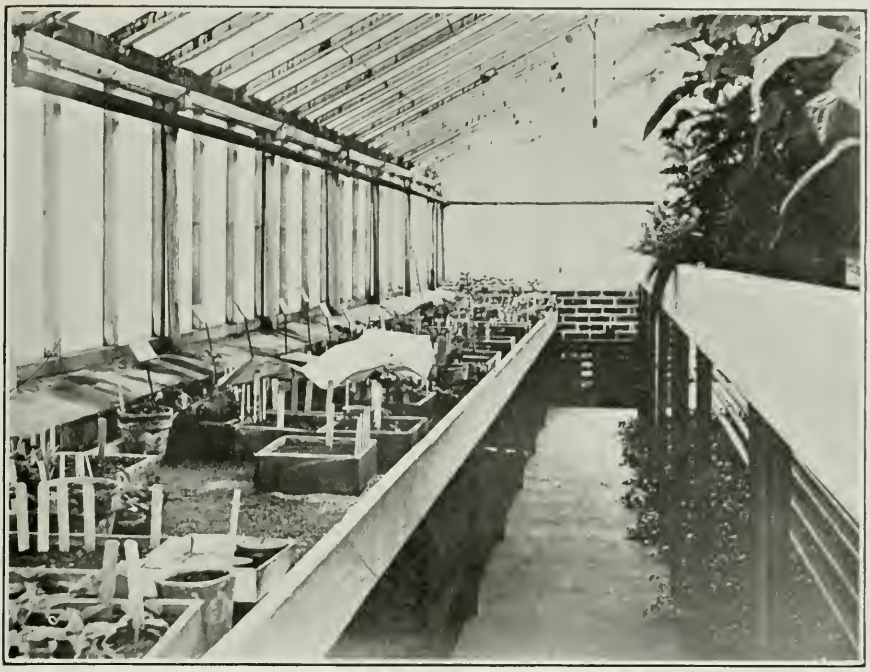
5. "The love of a flower in the heart of a child is the highest thing that nature study can hope to develop."—p. 91. If you think this true, explain; if you think it is not true, explain what you hold to be the highest aim.

6. One hundred and thirty-six pages are devoted to insect studies; about how many different species of insects can you recognize? How many of the butterflies listed on pp. 264-274 do you know on sight?

7. Fifty-seven pages are devoted to a consideration of bird studies; about how many of our common birds do you know by sight or song, or by both?

8. In what ways may the Nature Study of the schools affect the lives of the people?

A few of the answers are submitted as showing the readiness of teachers to acknowledge new pedagogical view points and to adjust themselves to the consequent new responsibilities.



Plant Propagation and Experiments, 1908.

A Lecture on Potatoes.

In answer to question 2 regarding the influence of the book:

"I feel quite sure that this book has influenced, is influencing, and will influence me in my school work."

"I have not noticed that it has influenced my work particularly, but I have noticed that since being at Guelph last summer I have enjoyed my work better than before and the children have worked better too."

"This book has been an inspiration to me. The reasonableness, the common sense attitude, the emphasizing of the economic side of Nature Study, above all the scientific and aesthetic have appealed to me very strongly."

In answer to question 3 regarding the use in their teaching of topics suggested in the book:

"Have used in my classes various parts from time to time. Some of those used this term have been:—'Dogs and their proper care;' 'Cats: their use and abuse;' 'The common House Fly;' 'The Honey Bee;' 'The Bumble Bee;' 'Birds: their use, care and protection, (had a splendid lesson on this, as a boy brought in a young plover with a part of its wing shot away); 'Weeds and identification through specimens and seeds.'"

"The topics I have made use of are:—'Insects of the Household: Flies, Mosquitos;' 'Beneficial Insects: Bees;' 'Insects, Beneficial and Beautiful: Butterflies and Moths;' 'Insects of the Garden: Tent Caterpillars and Cutworms;' "Flowers, Plants: Bacteria and Moulds.'"

"I have made some use of what I have read but intend to put more of it in practice. We have had some interesting talks on the Domestic Animals. Then plant growth has made my Literature lessons more profitable. The section on trees helped also, as we had a list of trees to study and draw for our County Examinations."

Conclusions: There seems to be a very important place for a Teachers' Reading Course in any schemes for the introduction of Agriculture into the public schools. Our teachers in most cases have not had their reading directed towards the subject while receiving instruction at the High or Normal Schools. It comes to them now as a new subject in their work of teaching. A reading course can help to direct the efforts of the teachers after they have been awakened into interest by preliminary instruction of a practical nature here at the College. It may help to sustain an interest which, aroused in the pleasant environment of a summer school, is in danger of lagging in the winter isolation of a country school. It tends to that effectiveness which comes from working together in a common interest. There is need, however, of keeping the list of books small and of having a supervision of a suggestive and helpful character.

The Class in Nature Study.

The class in Nature Study was made up of twenty-nine teachers, six of them being from the United States. Nine of the number were teachers in country schools, and the remainder teachers in graded schools of towns or cities. The work followed was similar to that taken in previous years. Much of the instruction was taken out of doors, about the College, in informal talks or lectures. There were field excursions for collecting weeds and insects, and laboratory exercises for a subsequent study of them. The College Museum was much used for becoming acquainted with the forms of our common birds and this was supplemented by bird studies on picnics and tramps in the woods.

This class joined the students in Agriculture in some branches of their work. They took instruction together in Horticulture, School Gardening and some of the Botany. Indeed our Nature Study altogether is always never remote from an economic agricultural consideration. The plants studied are garden flowers, vegetables in the school gardens, crops in the fields, weeds in the lawn and garden and the shade trees of the campus.

A Lesson Out-of-doors—Plant Propagation.

Schoolmaster's Home. Marden School.

The animals studied include the fowl at the Poultry department and the cows in the Dairy department as much as wild birds and other animals. On the mechanical side of the study there is consideration of the farm machinery as much as that used in the city factory for making pianos or sewing machines or cream separators.

In another part of this report there will be found a few extracts from letters received from some of the teachers who joined the reading course. There is reason to believe that the work taken here enhances the value of the instruction given by them in the schools besides bringing to them great pleasure in their work.

We were favored with three special lectures by outsiders. Mr. Dearness, Vice-Principal of the London Normal School addressed the class on "The Field and Method of Nature Study," Mr. W. E. Saunders of London on "The Lives and Habits of Birds," and Mr. W. D. Hobson of Woodstock on "Our Common Birds and their Songs."

While the subject of Nature Study naturally deals most directly with the common things of the fields and woods, there is a large field for observation and study in the workshop and factory and in the products of man's handiwork. For town and city children this may offer the readiest and best nature study material. In following out this idea the class visited the Guelph Gas Works, the Guelph Paper Box Factory, Tolton's Agricultural Implement Works, Goldie's Flour Mills and the Bell Piano and Organ factory. At all the places we were given a hearty welcome and taken in hand by guides who showed us about and explained the processes of manufactures. Our classes owe much for the pleasure and profit of such visits to our Guelph industries. During the past four years we have visited most of the city's manufacturing plants. In every case we have been treated very kindly indeed.

Outside firms have been no less kind. In the spring the Third Year Class made a visit to Hamilton and the Niagara country and were welcomed and instructed by the International Harvester Company, the Petrie Cream Separator Company and the Hamilton Iron and Steel Company, of Hamilton, by Mr. E. D. Smith at his nurseries at Winona; by Mr. Peart at our Jordan Experimental Fruit Farm, and by the Ontario Power Company at Niagara Falls. To all of these our thanks are extended.

School Gardens.

The classes had a very successful experience with their gardens this summer. There were four reasons for this. In the first place our ground was much improved over previous years by repeated cultivation and was in good condition for working into garden plots on the arrival of the class. In the second place there was no delay in commencing operations; on the first day of the session the teachers were introduced to the work and allotted their plots. And in the third place the work was taken as a recreation and instruction given altogether informally; the gardens became a favourite resort for the sudents in the evenings where they compared notes and put their plots into order. Besides we had the good services of Mr. Howes, Principal of the Consolidated School, in helping, advising, suggesting and explaining. He was available to students at whatever time they might come to him. The gardens belonging to the children of the Consolidated School were used for illustration purposes.

The students learned much too from a visit to the garden at Marden school. For Mrs. Buchanan's hospitality and Mr. Buchanan's explanation

of how he conducts his work, we extend our thanks. The Marden school garden is in size, arrangements and undertakings such an one as might be undertaken in many of our country schools.

All the teachers in Agriculture and Nature Study had gardens. A few teachers from the other classes also undertook the care of plots.

The following comprised the class:

Nature Study.

Barber, Etta L., Miss, Guelph.
Barbaree, Mary M., Miss, Nassagaweya.
Brown, Isabel H., Miss, Toronto.
Calvert, Lula, Miss, Nassagaweya.
Cameron, Carrie, Mrs., St. Catharines.
Doane, Emma, Miss, Cleveland, Ohio.
Duff, Mary, Miss, Lakefield.
Gochenour, Catharine, Miss, Wabash, Ind.
Hoppins, Elizabeth, Miss, Kingston.
Kinerk, Annie, Miss, Wabash, Indiana.
McArthur, J. Evelyn, Miss, Gobles.
McHenry, Carrie, Miss, Wabash, Indiana.
McKee, Mildred R., Miss, Brandon, Man.
McKinlay, Margaret, Miss, Sarnia.
McMaster, Jessie, Miss, Sarnia.
Orr, Jessie I., Miss, Toronto.
Pickett, Laura, Miss, Vittoria.
Poppelwell, Maude, Miss, Wayside.
Robertson, Margaret, Miss, Wabash, Ind.
Ross, Alberta, Miss, Sarnia.
Ross, Carlotta E., Miss, Toronto.
Stanley, Miss, Fort Frances.
Small, Cora, Miss, Wabash, Ind.
Stanbury, Florella, Miss, Bayfield.
Stevenson, Alice J., Miss, Hewitt.
Thompson, Margaret, Miss, Port Perry.
Waite, Harriet B., Miss, Wabash, Ind.
Watson, Vesta A., Miss, Goderich.
Woods, Lizzie, Miss, Smith's Falls.

Teachers' and Scholars' Excursions.

We have had the following excursions during the year:
May 29—Waterloo and Berlin Teachers' Association.
June 4 and 5—Victoria Teachers' Association.
June 8—Galt High School.
June 13—Lincoln Teachers' Association.
June 16—S. Brant Public School.
June 22—Durham Teachers' Association.

The teachers' conventions were well attended and were marked by a lively interest in the meaning of agricultural education as it is represented by the College work and equipment. The Victoria County Association's visit was a particularly successful one. It had been well organized by Inspectors Knight and Stevens and Mr. Reed, Agricultural Representative at Lindsay, and their whole programme was carried through splendidly. Their excursion was for two days and the second day seemed to have almost as many representatives and as much enthusiasm as the first day. There were very few teachers of the county who were not present. As a rule the month of June is not a good time for the teachers' excursions. The crowds attending the Farmers' Institute excursions prevent the teachers remaining together as a body and taking advantage of the special instruction prepared for them. Besides the weather is hot and after a long railway journey strength fails for a busy sight-seeing tramp. When a low railway rate can be secured by the teachers' associations without joining an Institute excursion, it would be better for them to make their visit in May or September and always for two days.

The excursion arranged for the Galt High School by Mr. F. C. Hart, B.S.A., Agricultural representative in Waterloo county, brought an unexpectedly large number of school children. The Galt school was joined by others in adjacent towns and our grounds and buildings were filled all day by busy, enquiring crowds, bent on making the most of their outing. A large number of instructors would be needed to conduct the different school groups of such a large party.

The Children's Excursion on June 16th.

In many respects the excursion of children from three of the rural schools of South Brant was most interesting. It was our first organized excursion of public school children and it showed the possibilities of an important field of service. We submit a somewhat full account of the experience in the hope of awakening a wider interest in the scheme.

For the past few years we have made a standing offer to teachers and inspectors to take charge of any organized party of school children which might come with their teachers on the Farmers' Institutes excursions in June. The pressing demands of midsummer examinations and a lack of organization amongst the rural teachers has hitherto prevented the getting of a party together.

Through the efforts of Mr. F. M. Lewis, Secretary of the South Brant Farmer's Institute, about fifteen scholars of the third and fourth classes in three of the schools in the Burford district were organized into a party under their teachers, Misses Johnson, Amy Robertson, and Iva Robertson. They spent the afternoon sightseeing under my direction. To me it was an interesting experience and to the children and their teachers profitable as well.

I have received from the teachers a few of the children's compositions treating of the day's outing. Some of their observations are suggestive of the possible educational value of this feature of the Institute excursions. A few extracts are given here:

"(1) We saw a specimen of saltpetre from Chili, and souvenir of hardened lava with 'Vesuvius' printed on it. It had been stamped while the lava was flowing. There were different kinds of coal. We also saw a devil fish with long feelers on it."

"(2) The first thing I noticed was that the stable was whitewashed, and there was not a cobweb nor a straw to be seen on the floor or ceiling, and they had iron stanchions instead of the old-fashioned way of using chains . . . and the handiest thing of all was the litter carrier. When I got home I told my father all about the stable, and as we were putting up a new barn this summer, he planned to have the stanchions and a low manger made of cement."

"And another thing Mr. McCready explained to us was how they found out how much milk each cow gave and how much butter she gave in a year. It is rather hard to explain, but nevertheless I will try. When a man milks one cow he weighs the milk and puts the number of pounds down to her, and then he puts a little milk into a bottle to see how much butter fat it contains, and if a cow does not pay for herself she is sold as quick as possible."

"(3) The different kinds of rock and ore were interesting to us because we read about them in our Geography, and can understand it better after having seen and heard them explained. . . . We went to the Macdonald Institute, and were much pleased to see the different things in the ladies' part, and I hope that some day I will be able to take a course. . . . The Consolidated School was interesting to us indeed. The gardens were nicely kept, and I hope that next time we will be able to spend more time about the school and have the pleasure of going through it."

As showing the value of the day, as measured by the parents, trustees and teachers, I submit here correspondence which Mr. Lewis had with the teachers directly concerned.

Prof. McCready,
Guelph, Ont.

Burford, August 31, 1908.

Dear Sir,—On June 16th you were kind enough to entertain and instruct the senior pupils from three of our public schools.

After the spree was over some time, I wrote each teacher asking for her impression of the day's outing, and the effect upon the scholars. Each replied and very decidedly approved of the day, and said the effect on the scholars was only good and helpful.

The scholars and their parents were delighted and the trustees approved of the day.

I believe we can bring a lot of them next season. Mr. Putnam is acquainted with what has been done, and has asked that I speak of it at Institute convention at Toronto on September 8.

Will you be kind enough to give me your conclusions regarding the matter, and say how many you could handle another season? It can be made a great help to our excursion in addition to the good that is done the boys and girls.

Very truly yours,

FRANK M. LEWIS,
Secretary S. Brant.

Copies of letters from teachers who had children at O.A.C.

MR. F. M. LEWIS,
Secy. S. Brant F. Inst.,
Burford, Ont.

BURFORD, June 24, 1908.

DEAR SIR,—You have asked my opinion regarding the educational value of a school children's excursion to the Experimental Farm at Guelph. In reply I would state that I think it is of value in these respects:—Not only is it of value to the pupils educationally in that they see and learn many things up there which they otherwise would not, but it is of value in fostering patriotism in the pupils, and it is in the school that we rear the future loyal and patriotic citizens of a country. Just a word to show how the excursion might have the effect of fostering a spirit of patriotism. They have a broader conception of the greatness and importance of not only Ontario, but Canada as a whole, from the exhibits in the Museum and elsewhere.

It has too, I think, the effect of attaching greater importance to agriculture in the minds of children growing up in the country where possibly there is a tendency for them to weary of the life on the farm, longing to throng to the already crowded manufacturing centres.

Then in regard to the way the schools are looked after at the Experimental Farm; they furnish one of the men of the faculty to act as a guide; this man spares no pains to explain everything in a lively and interesting way attractive to the children, drawing many moral lessons from things here and there. For instance, we were in the agricultural museum and he explained the experiments which had been tried for sowing grain, and also showing which grains should be sowed first in spring and which next, and so on. The boys were greatly interested in this.

I do not think it made a very serious break in the Entrance work. I rather think it did the pupils good, although I must not say, as the Entrance reports are not yet out.

Which benefited most, the boys or the girls? I cannot say, as there were things of interest to each and all.

I sincerely hope these few remarks may be sufficient to reply to your letter, and I hope your excursion may be an annual affair.

Yours sincerely,

(Signed) ESSIE JOHNSON,
Teacher, U.S.S. No. 11,
Burford, Ont.

FAIRFIELD PLAIN, June 25, 1908.

DEAR MR. LEWIS,—I am sorry that my reply will, of necessity, be very insufficient and brief. I received your letter only last night, and then thought it too late to make an attempt, but now think you may possibly get it if you go to the post office before the meeting.

You ask if it made a serious break in the school studies. On the contrary it formed a most interesting introduction to many lessons. For instance the children were so interested in seeing the lava from Vesuvius, and thereby got a much more vivid conception of what lava is, and were very ready to find out more about volcanoes, where Vesuvius is, etc. The sight of the devil fish, though it inspired them with horror, also made them read with renewed interest and more real understanding, the lesson in the Fourth Reader on the devil fish. As for their Nature Study, it afforded very solid

ground for that study, for looking at the various specimens of animals, birds and snakes, they wanted to find specimens of the same,—*i.e.*, it gave a basis of identification. Even, for the above reasons, I should say unhesitatingly that an annual excursion would be a good thing.

"Which benefited most, boys or girls?" I, myself, had no boys with me, but watching those of the other school, it seemed to me that the *practical* interests of the boys were more awakened than that of the girls. The visit to the poultry yard and cow barns, and the comparison of the wheat, barley and oats seeded at various times throughout the year especially impressed them with lessons of cleanliness and the value of thrift and energy.

As for the effects on the Entrance pupils, it seems to me that it would be better for them to go on the excursion before they get to the Senior Fourth, for it certainly is a *very* tiring day and they *can't* work as well after it as before, till they are rested. The teacher can resolutely put aside her tiredness, but it is almost impossible for children.

We thought it was a *very* interesting and happy day for us all. Hoping this will meet your purposes to some degree at least, I am,

Yours very sincerely,

(Signed) Iva L. Robertson.

Fairfield Plain, June 23, 1908.

Dear Mr. Lewis,—Received your letter, and will be pleased to answer your questions. In the first place I may state that with the exception of one, all my pupils were in their places on the following day. That one, I may add, was a delicate child.

As regards the break in the school work, perhaps the pupils were not so bright as usual on the following day, but I consider this disadvantage was more than made up in the advantages they derived. The pupils I took were in the Second, Third and Fourth classes.

The advantages derived were many, but I shall mention only one or two. The process of sugar making especially struck the second class pupils. I noticed them paying particular attention to the bottles containing the sugar in its various stages, *e.g.*, from the sugar cane to granulated sugar and also the lower grades of sugar. On the following day they asked that we read the lesson on sugar in their reader. We did so and I noticed that all the little excursionists were paying particular attention. Now that lesson on sugar becomes a real live lesson to those pupils, of something they have actually seen for themselves, and not of something away off from us.

The excursion would be a benefit if only for the help the Entrance class derived in seeing the devil fish. In the Fourth Reader is that lesson on the devil fish that is so hard to make the children understand. I myself had never seen the devil fish before and can appreciate the help the Entrance class derived from seeing it. Also the impression of the ferns in the coal were exceedingly helpful. The pupils called my attention several times to view specimens, of which we had been reading the previous week.

The advantages were not confined only to those who went. Only one-fifth of my pupils went, yet the knowledge learned at that experimental farm was conveyed to the remaining four-fifths the following day. At recess, at noon, little groups could be seen, with an excursionist as the centre of attraction. Various were the things being told; how they kept a record of the milk of each cow, how the butter and cheese were made, and the old machinery. The old machinery appealed greatly to the boys. One child told the others that the woodchuck we had in the spring was also called a rodent, and so I could go on.

I cannot say which profited most, as different things appealed to the girls and boys. I think such an outing annually would be of great benefit to the children. We are inclined to keep the children too steadily at books, books, books, and forget that it is by handling and seeing that children most easily learn.

Hoping that this will be of some use to you, believe me,

Sincerely yours,

(Signed) Amy M. Robertson,
Fairfield Plain School.

Conclusions: This branch of work might readily become a very important factor in introducing agricultural teaching into the schools. If it should develop through the co-operation of Institute workers and school superin-

tendents, there should always be an attempt made to keep the number of scholars for one instructor small and to have the teachers accompany their classes. The day's instruction will always need to be followed up by the teacher in her daily routine of lessons afterwards, if its best end is to be reached.

The day's experience impressed me strongly with the great use and value of a good museum. I am certain that we have hardly begun to realize this in regard to ours. And at no time in the year could there be so much use made of it as during the June excursion. I have overhauled the Museum this summer and used it with the children and our teachers' classes. The museum is too often and too much non-explanatory of itself; a guide is needed. There might be a part set apart with seating accommodation that could be used for informal talks or lectures at stated hours. To make the collection more comprehenisve the exhibits in the Agricultural museum should be brought over to the main building. There is need too of much re-arranging and relabelling.

Our Plans for Bringing about the Introduction of Agriculture into the Schools.

The problem of bringing about the introduction of agricultural instruction into the schools is a large one and a difficult one. It is a large one in that it concerns such a large part of our population and has to deal with a business that is marked by manifold diversity of the sciences underlying its practice. It is a difficult problem in that the work must be done by a teaching body that has not been trained and which it is difficult to reach.

It is generally felt that the crux of the matter lies with the training of the teacher to carry on the instruction in a practical manner. This is the general plan now being tried where ten years ago it was by means of a text book in the hands of the teacher and pupils. Moreover now we have it an optional subject where a few years ago it was obligatory in school programmes.

We offer below a summary of the plans with a few comments. Further, suggestions for new lines of endeavour are offered for consideration.

1. Our Summer Courses for Teachers.
2. Teachers' Reading Course.
3. Three Months' Course for Teachers in Spring Term.
4. Lectures and Demonstrations at Teachers' Conventions.
5. Visits to the College by Teachers' Associations.
6. Visits of School Children and their Teachers.
7. Correspondence with Teachers and Pupils.

1. *Our Summer Courses for Teachers.* The limitations of this scheme lie mainly in the fact that the teachers in rural schools cannot very well afford the expense. Moreover they are not as a body looking forward to permanent employment in rural schools and do not feel any urgency in equipping themselves for a special line of work that is optional.

The chief value of our summer courses is not in the number of schools that are reached through our students, for that is relatively very small. It is rather in commencing a growth of sentiment amongst teachers in favour of the work.

2. *Teachers' Reading Course.* This scheme has been discussed at length elsewhere. It is hoped that as the interest advances, we may have teachers join it because of the opportunity offered for help towards self-improvement and greater usefulness in their school work.

We have extended the privileges to teachers at their Association meetings. In the meantime they are used chiefly by those who have been in training here.

3. *Three Months' Courses for Teachers in the Spring Term.* This work commences next April with a class of teachers selected from the classes at present in attendance at the Normal Schools. The students will be selected from those members of the Normal classes who have been trained at the Model Schools and had experience in teaching. The plan marks a distinct advance in the attitude of the Government towards the question of industrial training in that the expenses of the students are to be paid. Some provision will be made for securing their services in the rural schools for a term of years. The course of study which will be followed will be that outlined in last year's report.

This scheme has limitations similar to the last mentioned. Only a relatively small proportion of the schools will be reached by it. Its chief value will be in creating a sentiment.

4. *Lectures and Demonstrations at Teachers' Conventions.* During the past year I have attended two Teachers' Conventions. On October 8th I addressed the teachers of North York at Aurora on "Agriculture in the Schools" and outlined plans for them to follow in making a commencement. On November 27th and 28th I joined the Haldimand Teachers in their Convention at Dunnville and gave them practical lessons in (1) seed selection, (2) weed seed identification, and (3) identification of a few common birds. Arrangements were made for an address and practical lessons to the Dufferin County teachers in February, but snow blockades prevented the holding of the convention.

I find an increased interest in Agricultural teaching being shown by the teachers and the inspectors in their meetings. Here and there throughout the Province there are teachers giving their teaching of Nature Study quite a distinct agricultural bearing. Their influence is being felt. In Haldimand County I was particularly impressed by the readiness of the teachers to try suggested experiments.

I believe there are great opportunities for our cause in helping the teachers in their local meetings. They cannot readily come to use. They are pleased to have representatives of the College go to them.

5. *Visits to the College by Teachers' Associations.* During the past year we have been visited by four associations—Berlin and Waterloo, Victoria County, Durham County, Lincoln County—comprising about four hundred teachers. In guiding them about the College, we attempt to point out those things that might find a place in the education of children in country schools.

The chief value of their visits lies in the impression left upon the minds of the teachers regarding the manifold importance of the chief industry of the Province and the provision made for instruction. It may fairly be hoped that there is some realization of an opportunity and a need of the public school sharing in the work.

6. *Visits of School Children and their Teachers.* This scheme has been discussed at length elsewhere. In a limited field it presents good chances for profitable, direct teaching. The teachers accompanying their classes cannot fail to see the reasonableness and naturalness of agricultural teaching.

7. *Correspondence with Teachers and Pupils.* With the organization of the Nature Study Department under the late Dr. Muldrew, this scheme was planned. This relationship with the schools grows closer year by year.

The number of applicants for help is gradually increasing. As a rule information is asked about Nature Study matters. Some teachers ask for suggestions for carrying on experiments with plants. Some ask for direction in the selection of text books.

Suggestions for Extending the Teaching of Agriculture into our Schools.

1. By organizing a Public Schools Agricultural Department under the Experimental Union.

2. By a rearrangement of the government apportionment of money for agricultural education through school gardens.

3. By arranging short summer courses for Public School Inspectors.

4. By arranging special summer courses for High School Science teachers.

5. By having College graduates in the Biology, Chemistry and Physics, and Bacteriology options admitted to specialist standing in Science, thus qualifying for High School teaching.

1. *Adaptation of Experimental Union work to the needs of the Public Schools.* For the past four years there has been an increasing number of the Union experiments undertaken by children through the suggestion of teachers. The teachers have been encouraged to make use of the Union for the purpose of introducing the subject of Agriculture into the work of the schools. As the experiments have been carried on in home gardens or fields there was no danger of injuring the reputation of school gardening in case of failure. This work has been done in Horticulture and Agriculture chiefly, but a number of schools have undertaken to care for material sent out by the Forestry Department as well. On the whole the results of this work have been quite satisfactory.

Perhaps the time has come for arranging this branch of the work so that it may be more widely and more easily used. Instead of having it in one hundred schools, we might bring it in a few years to a very large proportion of our rural schools. This may be done by simplifying the work and sending out printed instructions for carrying out the experiments and using them for instructional purposes in the school work. The experiments would be placed in small plots in the school grounds or in a farmer's field immediately adjoining. For each year a select list of simple experiments would be chosen and material for these would be sent to applicants with sheets of instructions. At the end of the season a report would be made to the Committee of the Union having the matter in charge. For example, for the season of 1909 the schools would be given material and instruction for exemplifying the value of seed selection as a topic in Agriculture; in Horticulture they would receive help to exemplify the testing and propagation of two varieties of onions and the cultivation of one flowering plant; in Forestry they would undertake to raise some seedlings for transplanting. In 1910 a different set of experiments would be offered. This work could be carried on in a piece of ground of a comparatively small size—about 20 x 10 feet.

From this might readily grow a tried course of Agriculture for our schools.

2. *Government Apportionments for Agricultural Education.* Should such a scheme as outlined above be taken up by teachers and trustees it might be advisable to change the plans for apportioning grants for school gardens. At the present time trustees are assisted in buying additional land

for a school garden and subsidized by a yearly grant of $20.00 when the school garden is satisfactorily conducted by a certificated teacher. But in the nature of things it will take many years to train a sufficient number of teachers to the required standard, and in the meantime those parts of the country which perhaps need agricultural education most will be no nearer attaining it. By following for *Gardening and Instruction in Agriculture* the splendid system of apportionment that now prevails for buildings, grounds, water supply, equipment, etc., the trustees of our schools would be encouraged to interest themselves in the matter and assist the teachers in developing it. The Gardening and Agricultural Education might be graded I, II, III, IV, in accordance with the size of the garden, the nature of the instruction given in the school, and the care of the plots, etc. If for Grade I $5 were allowed, for Grade II $3.75, for Grade III $2.50, for Grade IV $1.25 or proportionally smaller amounts as the grant permitted the distribution throughout the Province would be equitable and encouraging.

3. *Summer Courses for Inspectors.* In correspondence with the Public School Inspectors through the year, we learned that quite a number favoured the idea of a week's course in July towards the close of our teachers' courses. As the character of the work in the schools is largely determined by their efforts and sympathies it may be readily seen how necessary it is to have their intelligent and united interest in any scheme for the general introduction of Agriculture. Moreover the great majority of them are actively sympathetic in the cause. The need is to have them confer and unite on common plans. A short course which would acquaint them with our plans for preparing teachers, the best plans for arousing interest and the agricultural needs of the Province would no doubt be appreciated and profitable.

4. *Special Summer Courses for High School Science Teachers.* Not the least important plan for bringing Agriculture into the schools lies with the High School Science teachers. It is not overlooked that our Agricultural Specialists are sharing in the High School Science teaching in the specially organized Agricultural Departments recently established. But it is only a relatively small influence which they exert in the science teaching of the Province as a whole, and a very long time must elapse before their influence can be appreciably noticed in the schools. In the meantime Science is being taught in 580 High or Continuation Schools (according to Report for 1907) which have an attendance of 34,707 pupils. When it is realized it is from these schools that the teachers go into the country schools, the wisdom of securing the help of the Science teachers may be seen. And these teachers are in many cases anxious to make the new adjustments for their work. They feel the need of it and the justice of it. One who took a selective course at one of our summer schools writes, "I may say that I have found it very profitable to me. Neither the High Schools of the past nor the Universities of the present time have done anything in preparing teachers for the work which they must undertake with the Nature Study classes. . . . Personally I should like to see some such course instituted for the option of High School teachers. Science teachers from various part of the Province could meet together for a few weeks. And apart from the needful training which they would receive in Nature Study, they would be helped by contact with each other, and by private or open discussions be able to deal more effectively with the other sciences of the school course. They would be welded informally into one body free to consult each other throughout the year, and better fitted to promote or oppose the occasional changes proposed in the syllabus of their work."

5. *O.A.C. Graduates in Biology, etc., as Science Specialists in the High Schools.* At the present time the Education Department of Ontario grants non-professional qualifications for a specialist certificate in science to University graduates in any department of the Natural and Physical Sciences, who having obtained honours in the First, Second and Third Years, were awarded at least second class honors in the Fourth Year provided the candidates have obtained honor standing in the following subjects: Biology, Chemistry, Geology, Mechanics, Mineralogy, Physics (these are selected subjects of different courses). The courses leading to this certificate are (1) Biological and Physical Sciences, (2) Biology, (3) Chemistry and Mineralogy, (4) Geology and Mineralogy.

No good reason can be advanced against admitting the Sciences of Agriculture into this list of courses, and on the other hand good reasons can be urged for bringing the arrangement about. Examination of the different courses of study will show that our students in Biology, Chemistry and Physics and Bacteriology receive an education in science quite equivalent in most respects to that gained at the University. There would need to be some adjustments made in our examinations to suit the requirements of the Education Department possibly, but these could be readily made. And of course the certificates would be restricted to matriculated students.

With representative graduates scattered throughout our High Schools as science teachers a tendency towards an agricultural science teaching would be fostered. It would make its influence felt in the country schools in time through the teachers, and the right time to influence the coming teachers is when they are in the High Schools and not afterwards when they are employed in the schools.

In this same matter, considerable advantage might be secured for agricultural teaching in the High Schools if our fourth year Biology were accepted as an equivalent by Toronto University for its B.A. degree to those students in Honor Biology who might elect to take the applied Biology of our College in their fourth year in anticipation of going into the work of teaching.

Respectfully submitted,

S. B. McCREADY.

PART XXI.

THE DEAN OF RESIDENCE.

To the President of the Ontario Agricultural College.

SIR,—As Dean of the Residence I have the honor to submit my report for the year ending December 31st, 1908. I assumed the duties of my present position on September 1st of this year; hence my report is based in part upon my knowledge of the work of my predecessor, R. R. Graham, B.A., who held office from October 1st, 1907, to August 31st, 1908. From a personal acquaintance with Mr. Graham and with his work, I am in a position to say that his influence upon the general tone of the student body was decidedly elevating, and that the duties devolving upon him were performed most conscientiously and with all due regard for the comfort and general welfare of the students under his charge.

My duties as Dean of the Residence require me to maintain such discipline in the residence as will be most conducive to a wholesome moral tone throughout the student body, and at the same time afford every student an ample opportunity to do the studying which the course and his own ability make necessary. Then, too, in this connection I see that rooms, halls, and all fittings are kept in good repair, and that such a state of cleanliness and tidiness prevails as will at all times render the dormitories comfortable and congenial to study. My duties further require me to preside in the dining hall, and to conduct roll call and prayers. Besides my work as Dean of the Residence, I take the English Composition with the First Year. This involves two lectures a week and the reading of numerous compositions. I found that the majority of the freshmen had on entering this institution, a very limited knowledge of English Grammar and Composition; in other words that they had not the ability to so build words into sentences and sentences into paragraphs, as to effectively communicate their thoughts on familiar subjects. Briefly stated, my mode of procedure in English Composition is to develop in my lectures the rhetorical principles bearing upon the effective use of the English language in speech or in writing. To illustrate and to impress these principles, exercises for class and home work are given, which exercises are carefully examined, errors indicated, and the work returned. A careful record is kept of all exercises handed in by each student.

Now that the new wing, built last year, is open and in use, we have in residence a larger number of young men than ever before. The number at present is 213. About 72 regular students and 6 specialists board out. To accommodate all the regular students who desire to board in, still another addition to the Residence will be necessary. In order to further promote their welfare and to bring about a greater feeling of contentment and satisfaction among the students a complete investigation as to conditions prevailing in the culinary department of the Residence is in progress, with a view to radical changes and thorough re-organization in that department in so far as such are necessary in the interests of the students. Improvements should and doubtless will be made here.

As usual, during the summer vacation, the residence was thoroughly cleaned, walls whitened, floors throughout the building oiled, wainscoting

painted, and repairs made wherever necessary. More beds, bedding, and furniture have been added in the larger rooms in order that the largest number consistent with comfort, might be accommodated. Our accommodation is now taxed to its utmost.

In regard to fire protection, we are now better equipped for that purpose than ever before. On the premises are fourteen hydrants all in good order and ready for instant use. In our fire sheds we have four good reels carrying over half a mile of new, or slightly used hose. The new water tank at an elevation of 125 feet, together with the fire pumps, afford abundant pressure. In convenient places are a number of good ladders. Within the buildings are small chemical fire extinguishers. The main building is equipped with fire escapes which are in good order. Shortly after assuming my duties it occurred to me that while something had been done in the way of fire protection, much yet remained to be done before we could consider ourselves adequately protected. The value of our property and the large number of human lives in the main building made the matter seem to me one of great importance. I secured the services of the Chief of the Guelph Fire Brigade, talked the matter over in student meetings and finally organized a brigade of 36 men. Our first drill was under the direction of the City Chief. Since then we have had numerous drills under my own direction. At the present time we have a very fair supply of apparatus, water pressure sufficient for any fire, and a brigade of trained and willing men.

In conclusion, permit me to say that the same sense of honor, loyalty and gentlemanliness which has always characterized the student body, prevails unabated to-day. I am on the whole greatly pleased with the general good behavior of our students and with the industry which they have manifested in the pursuit of their studies. It is a matter of great satisfaction to me to feel that I have the co-operation of the student body in my endeavors to enforce such rules and regulations as are necessary in connection with life in the Residence. I have endeavored to deal fairly with all and to be reasonable in everything.

Respectfully submitted,

GEO. M. FRIER.

PART XXII.

THE LIBRARIAN.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to submit herewith the report of the Library for the year 1908.

During the past year 1,030 volumes have been added to the Library; 165 of which have been magazines, reports and bulletins that were bound, and classified as follows:

Agriculture	45	Forestry	2
Agricultural reports	89	Geology	14
Apiculture	9	History	53
Bacteriology	12	Horticulture	32
Biography	24	Horticulture reports	10
Botany	34	Hygiene	23
Chemistry	44	Literature and composition	164
Dairy	22	Manual training	4
Description and travel	7	Mathematics	6
Domestic animals	50	Meteorology	5
Domestic science	35	Nature study	3
Drawing and decoration	12	Ornithology	1
Economics	31	Physics	7
Education	26	Psychology	16
Engineering and electricity	26	Reference and general magazines	93
Entomology	6	Science	16
Ethics and religion	32	Science reports	12
Fiction	32	Useful arts	6
Fine arts	9	Zoology	6

The reference sets which have been added are:

Encyclopedia Americana, 16 v.

Garnet, R. and others, Universal anthology of literature, 33 v.

Cyclopedia of architecture, carpentry and building, 10 v.

Lord, John, Beacon lights of history, 15 v.

World's work, 1900 to date.

We wish to take this opportunity of expressing our appreciation of all our exchanges, especially those of the United States Department of Agriculture, the Experiment Stations of America, Australia, Cape Colony, Japan, India, South America and Europe.

In the work of recataloguing the Library we have been able to do nearly 600 books; that is, all the books on horticulture, and many on English literature including all the books on Shakespeare and Tennyson. Besides these we have recatalogued the bulletins and reports of the United States Department of Agriculture, the Experiment Stations of the United States and other countries, and the magazines of which bound files are kept.

The periodicals bound during the year have been 188 in number, while 61 books have been rebound.

The circulation of books which have been given out to students for use over night has been 4,905 during the past year. No account can be kept of the books, magazine articles, bulletins, etc., which are used in the reading room only; and as this forms a very large part of the library work, the circulation figures can show only approximately how much the Library is used.

The period of the largest circulation was during the winter term when from January 1st to April 15th 2,413 books were given out.

EDITH C. DWIGHT,

Librarian.

PART XXIII.

THE PHYSICIAN.

To the President of the Ontario Agricultural College:

SIR,—I have the honour of presenting to you my report for the current year.

It will scarcely be necessary for me to give details of the many slight ailments or injuries which have come under my care during the year. They have been very numerous and there have been a large number of serious cases also. The winter months passed by with about the average sickness incident to that time of the year. Nothing out of the usual occurred except an outbreak of Rötheln, which spread widely amongst the students of the College and the Hall. No one was very ill with it and I need not make any special reference to any other cases, beyond stating that we were obliged to send a number of our patients to the city hospitals or employ a trained nurse for them.

The Autumn term opened with a large increase in the attendance. The weather was very fine and favourable to out-of-door life and to the maintenance of health. So there has been no sickness out of the ordinary thus far this term, until within the last fortnight or so. A few minor accidents have occurred and one case of varicella. At the present time we have also one case of typhoid fever in St. Joseph's Hospital, and the patient is very ill.

At the opening of the College term I was called on, as in other years, to vaccinate a large number of students. Owing to their time being fully occupied from the day of their arrival and to objections on the part of some, it is difficult to get this important duty done. In my opinion it should be rigidly required before admission and so announced in the calendars.

On account of the largely increased attendance the bathing facilities seem to be unequal to the demands made upon them, and an increase in the accommodation in this respect has become necessary, especially, I should say, in the number of shower-baths, which, in my judgment, should be doubled.

The general sanitary conditions of the College and Hall are excellent.

W. O. STEWART.

Guelph, December 2, 1908.

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Thirtieth Annual Report

of the

Ontario Agricultural and Experimental Union

1908

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K CAMERON, Printer to the King's Most Excellent Majesty
1909

WARWICK, BRO'S & RUTTER, Limited, Printers,
TORONTO.

To the Honourable JOHN MORISON GIBSON, K.C., LL.D., etc., etc., etc.,
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Agricultural and Experimental Union for 1908.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1909.

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MEMBERS FOR 1908-1909.

The following list of members includes all of those who are or have been connected with the Agricultural College, and have paid the annual membership fee for the present year. It is quite distinct from the list of co-operative experimenters, of whom there are now about 6,000.

Allan, F. W., Churchill.
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MEMBERS FOR 1908-1909.—*Continued.*

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McMillan, H. R., Ottawa.
McMillan, A., Dutton.
McRae, F. C., Beaverton.
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McVannel, A. P., Picton.

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Neff, E. F., Hamilton.
Neville, S. J., Cottonwood, Sask.
Newell, C. A., Kilbride.
Newman, L. H., Ottawa.

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Nicholson, Chester, Mount Forest.
Nunnick, F. C., Scotland.

Orser, O., Kepler.
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Ross, H. E., Strange.
Ross, W. H., Beaverton.
Ross, W. A., Guelph.
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Ryrie, H. S., Oakville.

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Sanders, R. G., Tillsonburg.
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Schuyler, C., Brantford.
Schuyler, R., Jarvis.
Scott, H. W., Lancaster.
Scott, W. R. M., Toronto.
Shepherd, F., Bloomingdale.
Shibley, C. S., Harrowsmith.
Shields, J. M., Smith's Falls.
Shorthill, J. R., Ballinafad.
Shuh, C. H., Waterloo.
Sibbald, Jr., W., Sutton West.
Sinha, S., Guelph.
Sirett, A. W., Rosseau.
Slater, J. A., Galt.
Smith, R. B., Columbus.
Smith, W. H., Chatham.
Smith, A. S., Chesterville.
Smye, G. C., Ayr.
Snyder, A. A., Blair.
Sorley, J. N., Cumming's Bridge.
Spear, W. R., Cobourg.
Spencer, J. B., Ottawa.
Spohn, H. B., Ancaster.
Springer, S., Guelph.
Squirrell, W. J., Guelph.
Sterling, J. H., Eglinton.
Stewart, P., Beaverton.
Stratton, R. W., Guelph.
Strong, W. J., Peveral, England.
Summerby, W. L., Russell.

Taylor, F., Cumberland Mills, Que.
Taylor, G., Guelph.
Thom, C. C., Guelph.
Thompson, Hugh, Jr., Magnetawan.
Tomè, A., Guelph.
Tomè, N., Guelph.
Toole, W., Whitevale.
Toole, A. A., Mount Albert.
Treherne, C. R. C , Guelph.
Trethewey, J. E., Port Hammond, B. C.
Tucker, H. S., Chapman.
Turney, A. G., Saventhen, Belgium

Underhill, M., Richard's Landing.
Upton, H. E., Peabody, Mass.

Van Sickle, P. O., Trinity.
Varcoe, J. R., Carlow.

Wade, R. W., Guelph.
Wallbridge, F., Belleville.
Walker, Wm., Guelph.
Walker, C. T., Haysville.
Warren, F. B., Gamebridge.
Waters, B. J., Ivan.
Weber, M., Winterbourne.
Webster, H. B., Science Hill.
Webster, C. A., Dundas.
Weir, E. A., Randwick.
Weils, E. A., Chilliwack, B. C.
Westover, C. A., Freleighsburg, Que.
Whale, I. B., Goldstone.
White, E. W., New Westminster, B. C.
Whiteside, E. A., Guelph.
Whyte, M. I., Banbridge, Ireland.
Wiancko, A. T., LaFayette, Ind.
Wilkinson, P. J., Cambray.
Williams, W. E., Clandeboye.
Wilson, Stanley, Rolling Dam.
Wilson, R. H., Walter's Falls.
Wilson, J. Epsom.
Wilson, J. A., Mt. Elgin.
Wilson, E. E., Box 47, Caledon.
Winslow, R. M., Victoria, B. C.
Wood, C., Guelph.
Wright, W. H., Delaware.
Wright, C. H. Agassiz, B. C.

Young, G. H., Waubuno.

Zavitz, C. A., Guelph.
Zavitz, E. J., Guelph.
Zavitz, Howard V., Coldstream.

Ontario Agricultural and Experimental Union.

OFFICERS FOR 1908-1909.

President.....J. O. Laird, Blenheim, Ont.
Vice-President.....G. S. Henry, Oriole, Ont.
Secretary and Editor.....C. A. Zavitz, Agricultural College, Guelph.
Assistant Secretary.....J. Buchanan, Agricultural College, Guelph.
Treasurer.....H. L. Hutt, Agricultural College, Guelph.
Directors.....G. C. Creelman, F. R. Mallory, R. S. Hamer, G. S. Carpenter, W. L. Lennox, F. C. Nunnick.
Auditors.....J. B. Fairbairn and W. J. Squirrell.

Committees on Experimental Work.

Agriculture.....Prof. C. A. Zavitz, (Director), J. Buchanan, W. J. Squirrell, A. E. Whiteside.
Horticulture.....J. W. Crow, (Director), H. S. Peart, A. McMeans.
Poultry.....Prof. W. R. Graham, (Director), G. A. Robertson, M. C. Herner.
Forestry.....E. J. Zavitz, (Director), H. R. McMillan, E. C. Drury.
Chemistry.....Prof. W. P. Gamble, (Director), Geo. McCalla, R. S. Hamer.
Schools.....S. B. McCready. (Chairman).
H. L. Hutt, (Horticulture).
C. A. Zavitz, (Agriculture).
E. J. Zavitz, (Forestry).
E. A. Howes, (Nature Study)

TREASURER'S REPORT, 1908.

Receipts.		*Expenditure.*	
Membership fees (387 at 50c.)	$193 50	Balance due treasurer last year	$104 35
Government grant	2,750 00	Interest on money borrowed...	4 50
		Agricultural experiments	1,555 00
		Horticultural experiments	844 49
		Chemical experiments	45 88
		Part expenses annual meeting 1907	51 75
		Part expenses annual meeting 1908	112 00
		Meeting of the executive	6 85
		Total	$2,724 82
		Balance on hand	218 68
Total	$2,943 50		$2,943 50

We, the undersigned auditors, declare that we have examined the Treasurer's accounts and find them correct.

W. J. Squirrell,
J. B. Fairbairn,
Auditors.

December 3rd, 1908.

Ontario Agricultural and Experimental Union.

ANNUAL MEETING.

The thirtieth annual meeting of the Ontario Agricultural and Experimental Union was held at the Ontario Agricultural College, Guelph, on Monday, Tuesday, and Wednesday, December 7th, 8th, and 9th, 1908.

The President of the Union, Mr. G. A. Brodie, B.S.A., Bethesda, Ont., presided over the regular sessions, and Mr. G. C. Creelman, President of the College, at the annual supper on Tuesday evening

SECRETARY'S REPORT.

By C. A. Zavitz, Professor of Field Husbandry, Guelph, Ont.

The Board of Control of the Ontario Agricultural and Experimental Union has held two meetings since their appointment one year ago, one in December, 1907, and one in September, 1908.

About 30,000 copies of the Annual Report of the Association for 1907 were printed and distributed by the Department of Agriculture in the early part of the present year. We are pleased to state that as the report was issued considerably earlier than usual, it reached the experimenters and others several weeks before the spring opened up, and thus gave good service to the farmers generally.

In 1908, co-operative experiments were conducted on about 8,000 farms throughout Ontario in the departments of Agriculture, Horticulture, Forestry, Poultry-raising, and Agricultural Chemistry. It is probably safe to say that the co-operative work was more extensive in 1908 than in any year previous. I believe it is also true that the work has been more thoroughly done and will probably exert even a greater influence than that of any one year during the twenty-three years in which the Experimental Union has been carrying on its present system of co-operative experiments.

In Agriculture, there are now no less than thirty-eight separate experiments which cover all the most important farm crops which are grown in the Province of Ontario, and which deal with varieties of crops, mixtures of grains and grasses, the application of commercial fertilizers, and different methods of cultivating the soil. In this department, the number of experimenters in 1908 reached 4,420, and that for the twenty-three years, from 1886 to 1908, inclusive, 49,485. The work in Agriculture has certainly been very extensive in its operations and influential in its results.

In Horticulture, the co-operative work of the past two years was decidedly more extensive than formerly. During these years it has included experiments with vegetables, as well as those with small and with large fruits. The total number of co-operative experimenters in Horticulture for the fifteen years from 1894 to 1908, inclusive, is 9,563.

The departments of Forestry, Agricultural Chemistry and Poultry-raising have all been doing good work during the year. A report of each of the

former two branches of the work will be presented at the annual meeting. As the work in the Poultry department, however, is yet quite incomplete, the report will be held over for another year. Owing to lack of time on the part of the members of the committee on Apiculture, no work has been accomplished during 1908.

The ex-students of the College and other experimenters throughout Ontario deserve great credit and sincere thanks for the excellent work which they are doing not only for themselves and their neighbouring farmers, but also for the general improvement of the agriculture of our country. It is stated, on good authority, that the output of Ontario farms has doubled in fifteen years. The Experimental Union has had a marked influence in bringing this about, as well as assisting greatly in the education of the people.

The Experimental Union has an excellent corps of experimenters. Some of these combine the practical experience obtained on the farm, the educational training secured at the Agricultural College, as well as the special training furnished by successfully conducting co-operative work on their own farms for a number of years in succession. Some of the men have furnished good reports of successfully conducted experiments in each of a dozen years.

It is probably not too much to say that the Experimental Union has exerted a considerable influence in developing a deeper interest in the Agricultural College, at which institution about 1,000 students attend and 40,000 farmers visit annually. It is gratifying to know that the Experimental Union is exerting a wholesome influence in many ways. May the work of the past encourage us to press forward in a humble, but hopeful and persistent manner to better and greater things in the future, and to thus make our work more perfect and more worthy of imitation.

PRESIDENT'S ADDRESS.

By G. A. Brodie, B.S.A., Bethesda, Ont.

We are here to celebrate the thirtieth anniversary in the organization of the Experimental Union. In so doing we extend a hearty welcome to the students, ex-students, and staff of this institution, to the Institute workers and all other visitors who are with us. We welcome you here. Let us join hands and make the thirtieth re-union the best on record.

We are here to discuss some of the problems affecting that great and most important calling which we are proud to say is ours. We congratulate the College staff on their record attendance of students and the efficient work that is being accomplished.

The year has not passed without its peculiar lessons, commencing as it did with almost a financial crisis in business and trade circles. It was, however, only through the daily press that farmers learned there was a depression, thus proving that agriculture is not only our great basic industry, but the most stable industry in the country. True, the farmers of the West did feel the financial stringency to some extent, owing largely to their greed for land and doing too much business on the credit plan, but in Ontario, save in a few isolated sections, there was little change from conditions which had prevailed for ten years. Possibly there has never been such a series of successful years as the farmers of Ontario have lately enjoyed, due, no doubt, to several causes such as, better transportation facilities in which we

share in the world's great markets; industrial activities and general expansion along all lines, and the settlement of the great West, which by helping to build up our cities has developed the home market. Climatic conditions have also been a great factor as well as the dissemination of knowledge through Farmers' Institutes and the agricultural press. But possibly the greatest work has been done by the Ontario Agricultural College, including that accomplished by the Experimental Union in introducing new varieties and thereby increasing the yield per acre. I am glad to say, too, that the Union is now engaged on a still more important undertaking in the creation of new varieties from which new records are expected. In the past year eight thousand farmers throughout Ontario were conducting co-operative experiments, and on four thousand, four hundred and twenty farms experiments were conducted in agriculture alone. Imagine what this means in the upbuilding of agriculture throughout the Province, each experiment being an object lesson and guide to the farmers of the locality surrounding the experimental plots, and from this source new seed grains are obtainable that yield much more per acre than the older varieties. Not only in agriculture have experiments been conducted, but also in horticulture, forestry, poultry raising, bee keeping and agricultural chemistry. Thanks are due to the Union, also, for its example in proving the benefits of co-operation and its great educational value to the country at large, yea! even extending its fruits to foreign lands.

The Union is advancing at a rapid pace and we must so continue. We must remember we are living in a fast age; everything is directed towards speed, the race horses, autos, railways, trolleys, steamboats, and now the airships, are all trying to make a new record. In professional, scientific, business and trade circles there is the same rush generally directed on lines to get rich quickly. In such times it is well to pause a moment and consider just where we are at, and what are the conditions affecting the farmer at the present time.

Possibly one of the greatest problems affecting agriculture to-day is the increase of noxious weeds throughout the whole country, decreasing the annual yield possibly 20 per cent., which means a yearly loss of many millions of dollars. Land is valuable according to its producing qualities, and noxious weeds not only reduce the yield, but also the value of farm property. Where perennial sow thistle is prevalent it seems to me that unless some co-operative measure is put into force we will never get rid of this terrible evil. Could not the Union outline a course of experiments with a view of ascertaining the best methods of controlling those worst weeds that really threaten the extermination of many good industrious farmers. I am sure they will find many anxious to carry these out and report at our next meeting. The Union might also champion the cause of intensive farming, for we must farm better. In the race for wealth there seems a craze for large farms, many thinking this means more money. This may be true for a year or two, but in the end is a failure. Farming is degenerating. Our forefathers were better farmers than we are. We seem to have caught the Western idea, and are trying to mine our land instead of farm it. Our forefathers when they settled here, worked hard, cleared the land, built roads and improved their surroundings, because this was to be their home. The Western idea of settlement is to accumulate all the land possible, make a fortune and get out. The same idea now prevails here—get rich and retire. These conditions are to a great extent responsible for poor farming. We in Ontario congratulate ourselves on being the leaders of the world in agriculture. Such is far from the truth. The old countries can teach us many

lessons. They practise intensive farming, and if we wish to occupy the proud position of leaders in agriculture, we must simply take the lesson and fall in line with intensive farming.

The labor situation improves slowly. We should encourage immigration of the proper sort, plan our work carefully, and use modern implements. If we consult our own interests we will oppose all bonus and bounty fed industries that on account of their bonus or bounty can outbid the farmer in the labor market, the bounty in some cases being sufficient to pay the entire wages of the industry. I am not one who believes that it is part of the Divine plan that the prosperity of one calling should be built on another's misfortune. We ask no favours, but demand equal rights.

The last season has been a dry one and we must again expect a series of dry years and provide ourselves with plenty of green fodder for fall use. The drought has taught us another lesson. The four hundred million loss Michigan has just sustained in forest fires, should be a warning to Ontario with its millions of acres of forest lands. Our Government cannot apply laws too rigid for the safety of our forests and those living in close proximity. Our losses must have reached millions of dollars last season alone, and there is nothing more deplorable than the sight of a vast country swept by forest fires. Another point to be remembered is that the world's timber supply is pretty well exhausted, and in a few years Canada alone will be the great exporting country, and her timber the source of vast wealth.

We must congratulate our former Minister of Agriculture on the selection of an Experimental Farm in Northern Ontario, which is bearing fruits in the advertising of Northern Ontario's rich agricultural lands even at the present day. We farmers of Ontario should be thankful for the great heritage of these rich agricultural lands now being opened for settlement.

The past year proves the part that electricity is destined to play on the farm in the near future. The harnessing of Niagara Falls and the transmission of power throughout Ontario is no longer a dream, but a reality. The application of power to agricultural operations seems likely within the next ten years, and this new method will carry great changes with it. The tapping of radial electric railway lines for power to run stationary farm machinery is said to be an accomplished fact in several of the States. It seems to me that farmers should be looking into this new enterprise and show claims as good as any for cheap power. We also gladly note the new fertilizer, lime-nitrogen, that no doubt will work wonders in the future agriculture of Canada. The day has arrived even in this new country when special fertilizers have a place and, like the older lands, we too must feed our crops. We also gladly welcome the introduction of rural mail delivery, which, in conjunction with the rural telephone systems, makes us no longer an isolated people.

After referring to the recent general elections, and regretting the fact that so few farmers were returned, the speaker proceeded to say:—

For years all farmers have realized and agree in saying that their greatest need is co-operation and union. There have been several attempts to organize, and possibly the Grange has done about as much as any towards union. However, it appears to me, that the farmers must organize on broader lines than has yet been effected. Let there be a grand union of the Grange, Experimental Union, Farmers' Institutes, Live Stock and Dairy Associations, Vegetable, Fruit, Poultry and Beekeeping Associations, and all other agricultural organizations, and in this great farmers' council discuss a scheme for a gigantic Farmers' Union with co-operation as the basis. It is co-operation, or else to be trampled upon. All other callings are joined

in unions to protect themselves, while we day in and day out plod to feed those who use their brains to get our money. Is the farm home worth protection? Are agricultural interests worth protecting? If so, rally around the co-operation flag. Let the college teach it. Let the Union proclaim it, the Farmers' Institutes, Live Stock and Dairy Meetings, and everything agricultural shout for "Co-operation and Union," and we will have it. Then, and not until then, will farmers be fully represented in our parliaments, and exercise their proper influence on all those great questions which affect our country's welfare.

J. O. Laird: I am very much pleased with the address we have just received from our President. He has given the matter a good deal of thought, and has given out some suggestions on which we might work with profit.

One point that I think is very important is the eradication of some of the weeds, especially of the sow thistle. I think if some experiments along that line could be thought out, farmers would be glad to take them up, and they could be carried on in connection with the Experimental Union work. We must engage in intensive farming in order to get rid of weeds, and I think that will eradicate them quicker than anything else.

This year has been rather a dry season and we should take a lesson from it. We should cultivate more thoroughly and keep the cultivator going from the first to the last of the season, and in doing so we will be rewarded for our labours.

The introduction of fertilizers, I believe, is a problem we will have to face. I think they will be commonly used in Ontario before ten years have passed.

The President spoke of the rural free mail delivery and the rural telephones which have been introduced into many counties. I am pleased to say that in the County of Kent we have a very fine rural telephone, and I think that the rural free mail delivery and telephone systems will certainly make farming a most pleasant occupation. We are less isolated than we were years ago.

RESULTS OF CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

By C. A. Zavitz, Professor of Field Husbandry, O.A.C., Guelph.

The co-operative work in Agriculture, conducted through the medium of the Ontario Agricultural and Experimental Union, has been more extensive during the past year than at any time previous. We are greatly pleased with the continued interest in this important work throughout the country, and with the enthusiasm by which it is carried out. During the past year, no less than 5,159 applications for experimental material were received. Of this number, 4,420 ex-students of the College and other farmers were supplied with everything necessary for conducting the co-operative experimental work. Owing to lack of help, finances, and material, we were unable to supply 739 applicants with the material for experimental purposes, and are holding these names over until another year. We are pleased to report, however, that the number of actual co-operative experimenters in 1908 was 390 in excess of that last year.

The weather conditions, on the whole, have been favourable for experimental work during the past year, and the committee is pleased to state that a greater number of valuable reports have been received in 1908 than in any year previous. The experiments with oats, winter wheat, barley, field peas, sweet corn, potatoes, and fertilizers were particularly good during the past year, but those with varieties of fall turnips and with different methods of cultivation of mangels were so poor that no tabulated data can be presented in this report. Owing to the exceptionally dry weather in the latter part of the summer in some sections of Ontario, the good reports from swede turnips, mangels, rape, kale, vetches, etc., are not very great in number. We are greatly pleased with the character of the work of a large number of our experimenters. They deserve great credit for successfully conducting the various experiments, and farmers owe much to these experimenters for the valuable reports which they have furnished and which are here presented in a summary form.

As the co-operative experiments have been conducted during the past year in every county and probably in every township of the Province, the results should be not only of local but also of general interest and should give service of great value. Not only does the Experimental Union furnish financial aid to the experimenters themselves and to the country as a whole, but it also encourages neatness and method in work, close observation, accurate calculation, thoughtful inquiry, and other important agencies which help so much in the education of the people.

For the benefit of those who are not familiar with our system of co-operation, it may be well to state that it is to a large extent the outgrowth of the experimental work done at the College, and that it is principally based on the results of that work. The experimental work in field agriculture was started at the College in 1876, and since that time it has gradually developed along various lines, until at present about two thousand plots are used annually in growing grains, fodder crops, grasses, clovers, roots, and potatoes; in testing manures and fertilizers, etc., with the object of obtaining information regarding the best varieties; the most productive selections of seed; the best time to sow the various classes of crops; the most improved methods of cultivation; the best mixtures of seed for the production of grain, hay, anl pasture; the best methods of maintaining and increasing soil fertility, etc. Since the beginning of this work, over two thousand varieties, of farm crops have been tested, and the best among these are now used for distribution in connection with the co-operative work of the Experimental Union, in testing varieties, fertilizers, methods of cultivation, mixtures, etc.

In the spring of each year, circulars on the co-operative work are distributed by the agricultural committee appointed by the Union. These circulars give a list of all the experiments for which material can be furnished. They are sent by mail to the members of the Experimental Union; to the experimenters of former years who have done satisfactory work; to leading farmers whose names have been suggested by secretaries of Farmers' Institutes, secretaries of Agricultural Societies, principals of Collegiate Institutes, and inspectors of Public Schools. They are also sent to all persons asking for information regarding the co-operative work; and to all the newspapers of the Province. In this way the work is brought to the notice of a very large proportion of the farmers of Ontario. The following gives the list of the co-operative experiments in agriculture, conducted throughout Ontario, in 1908.

Co-Operative Experiments for 1908.

Spring Grain Crops.

	Plots.
1. Testing three varieties of Oats	3
2*a*. Testing three varieties of six-rowed Barley	3
2*b*. Testing two varieties of two-rowed Barley	2
3. Testing two varieties of Hulless Barley	2
4. Testing two varieties of Spring Wheat	2
5. Testing three varieties of Buckwheat	3
6. Testing two varieties of Field Peas	2
7. Testing Emmer and Spelt	2
8. Testing two varieties of Soy, Soja, or Japanese Beans	2
9. Testing three varieties of Husking Corn	3

Root Crops.

10. Testing three varieties of Mangels	3
11. Testing two varieties of Sugar Beets for feeding purposes	2
12. Testing three varieties of Swedish Turnips	3
13. Testing two varieties of Fall Turnips	2
14. Testing two varieties of Carrots	2

Forage, Fodder, Silage and Hay Crops.

15. Testing three varieties of Fodder and Silage Corn	3
16. Testing three varieties of Millet	3
17. Testing three varieties of Sorghum	3
18. Testing Grass Peas and two varieties of Vetches	3
19. Testing Rape, Kale, and Field Cabbage	3
20. Testing three varieties of Clover	3
21. Testing Sainfoin, Lucerne, and Burnet	3
22. Testing four varieties of Grasses	4

Culinary Crops.

23. Testing three varieties of Field Beans	3
24. Testing three varieties of Sweet Corn	3

Fertilizer Experiments.

25. Testing fertilizers with Potatoes	8
26. Testing fertilizers with Swede Turnips	6

Miscellaneous Experiments.

27. Sowing Mangels on the level, and in drills	2
28*a*. Testing two varieties of Early Potatoes	2
28*b*. Testing two varieties of medium ripening Potatoes	2
28*c*. Testing two varieties of Late Potatoes	2
29. Testing three grain mixtures for grain production	3
30. Testing three mixtures of Grasses and Clovers, for hay	3

Autumn Sown Crops.

31. Testing Hairy Vetches and Winter Rye as fodder crops	2
32. Testing three leading varieties of Winter Wheat	3
33. Testing five Fertilizers with Winter Wheat	6
34. Testing Autumn and Spring Applications of Nitrate of Soda and Common Salt with Winter Wheat	5
35. Testing two varieties of Winter Rye for grain production	2

Most of the plots were one rod wide by two rods long, being exactly one-eightieth of an acre in size. In former years some plots consisted of one-tenth acre and a few of one-half acre in size, but for most experiments these were found less satisfactory than the small plots.

For the following summary, only the results given in the most reliable reports were used. Many of these reports have been sent in by men who have had a large amount of practical experience on the farm; have had the advantages of a good education, and by means of conducting experiments in former years have become quite expert in the work. It should be remembered, however, that while only the good reports of carefully conducted experiments have been used for publication, many of those not included in the summary show that the individual experimenters must have obtained a considerable amount of value from the work. It frequently happens that, owing to some unavoidable accident, the experiment may have been injured to some extent so that the results could not be used in the general summary, and yet the experiment may have furnished useful lessons to the farmer conducting it. In all cases, experimenters obtain much more information from the work which they have carried on than can be given in a tabulated report.

Very carefully prepared instructions for conducting the co-operative work were furnished each experimenter in the spring of the year. While these instructions were not so elaborate but what they could be carried out in every detail, they were sufficiently comprehensive and specific to cover the important parts of the experiment in the search of reliable and valuable information, from a practical point of view. Besides various questions regarding the details of the experiments, the different experimenters were asked to give their decision as to the relative standing of the different varieties, mixtures, methods of cultivation, and fertilizers, taking everything into consideration bearing on the various phases of the experiments and on their own knowledge of their requirements regarding the soils of their farms, the systems of farming practised, the requirements of the markets, etc. The summary of the answers to this line of inquiry is presented in the tabulated results under the heading of comparative value.

Varieties and Mixtures of Grain Crops.

The co-operative experimental work, with varieties and mixtures of grain crops, as conducted by the Experimental Union in 1908, deals with those crops which were grown on no less than 5,757,333 acres throughout the Province during the present year. We believe that the work of the Experimental Union has had a very marked influence on the cereal crop production of Ontario during the past few years. It is also believed that the results which are presented in this report are of very great value to those farmers in Ontario who are at present living on those farms which comprise nearly six million acres devoted to the annual cultivation of cereal crops. In the table here presented, the yield of straw, as given in the second column, represents the total crop less the amount of grain, and therefore includes the chaff with the straw. The yield of grain is given in pounds and also in bushels per acre, in order that the results may be more clearly understood and that comparisons may be made between the different classes of crops as well as between the varieties of each class. Owing to the great variation in the weight per measured bushel of the different crops, it is easier to compare the results in pounds than in bushels per acre.

The average results of the successfully conducted experiments with varieties and mixtures of grain crops are presented in the following table:—

GRAIN CROPS, 1908.

Experiments.	Varieties	Comparative Value	Yield per Acre. Straw tons.	Grain lbs.	Grain bus.
Oats (115 tests)	Yellow Russian	100	1.26	1,578	46.42
	Irish Victor	99	1.19	1,531	45.04
	Daubeney	75	1.10	1,465	43.08
Six-rowed Barley. (36 tests)	No. 21	100	1.15	1,638	34.13
	Mandscheuri	100	1.18	1,610	33.53
	Oderbrucker	70	1.20	1,517	31.60
Two-rowed Barley. (8 tests)	Hanna	100	1.10	1,290	26.88
	Two-rowed Canadian	94	.81	930	19.38
Hulless Barley. (10 tests)	Guy Mayle	100	2.50	1,794	29.91
	Black Hulless	80	2.53	1,540	25.67
Spring Wheat. (15 tests)	Wild Goose	100	1.16	1,062	17.70
	Hungarian	88	.89	875	14.59
	Red Fyfe	81	.82	856	14.26
Buckwheat (8 tests)	Rye	100	1.86	1,455	30.32
	Silver Hull	95	2.02	1,185	24.68
Emmer & Spelt (9 tests)	Common Emmer	100	1.39	1,731	43.28
	Red Spelt	40	1.08	1,002	25.06
Winter Wheat (17 tests)	Imperial Amber	100	1.36	1,555	25.92
	Abundance	81	1.18	1,397	23.29
	No. 5 Red	69	1.19	1,332	22.20
Winter Rye (5 tests)	Mammoth White	100	1.57	1,904	34.00
	Common	67	1.47	1,602	28.60
Field Peas (53 tests)	New Canadian Beauty	100	1.52	1,641	27.35
	Early Britain	78	1.33	1,503	25.06
Field Beans (14 tests)	Marrowfat	82	.77	1,586	26.44
	White Wonder	100	.67	1,537	25.61
	New Prize Winner	65	.64	1,299	21.65
			Whole Crop.		
Corn for Grain (17 tests)	King Philip	93	7.49	2,594	46.33
	Compton's Early	100	7.53	2,421	43.23
	Genesee Valley	80	6.59	2,172	38.79
			Straw		
Mixtures (6 tests)	Daubeney Oats, 34 lbs. per acre; Mandscheuri Barley, 48 lbs. per acre	100	.97	1,580	.....
	Siberian Oats, 34 lbs. per acre; Two-rowed Canadian Barley, 48 lbs. per acre	85	1.03	1,406	.....
	Siberian Oats, 25 lbs. per acre; Two-rowed Canadian Barley, 35 lbs. per acre; Wild Goose Sp. Wheat, 22 lbs. per acre	67	1.04	1,320	.....

Varieties of Oats. About two hundred and fifty varieties of oats have been under experiment at the Agricultural College within the past twenty years. New varieties have been introduced from time to time, and after

five years' tests the poorer kinds have been dropped and those which have given the most satisfactory results have been retained in the tests. Nearly all of the varieties here referred to have been grown at the College for at least five years in succession, while a few of them have been under test for nearly twenty years. By referring to the report of the Department of Field Husbandry at the Agricultural College for 1907, it will be seen that the Yellow Russian gave the highest yield of grain per acre of all the varieties grown for the five years previous. It will also be observed that the Irish Victor stood fifth in the average yield per acre of the fifty-nine varieties there reported. These two varieties, along with the Daubeney, were distributed throughout Ontario in the spring of 1908 for co-operative experimental work. The Yellow Russian and Irish Victor are medium in maturity and possess spreading heads of grain of very good quality. As the grain of the Yellow Russian, however, has a yellowish cast, it is probably not quite as good a selling variety as the Irish Victor, which has grain which is white. The Daubeney is about ten days earlier in reaching maturity than either the Yellow Russian or the Irish Victor. In weight per measured bushel, the three varieties do not vary greatly, but each produces grain which comes closely to the standard weight for oats in Ontario. The percentage of hull, however, of the Daubeney oats is exceptionally light, being only about 24 per cent. The grain of the Daubeney variety, therefore, is of very excellent quality, being superior to that of nearly all other varieties of oats in composition. The Daubeney has been used in the co-operative experiments over Ontario in each of six years, but the Yellow Russian and the Irish Victor varieties were distributed in 1908 for the first time. In the average results of carefully conducted experiments with these three varieties on one hundred and fifteen farms throughout Ontario, we learn that the Yellow Russian gave the highest yield per acre, the average being 46.4 bushels. This yield was about one and two-fifths bushels greater than that of the Irish Victor, and three and one-third bushels greater than that of the Daubeney. In popularity, however, there was but little difference between the results of the Yellow Russian and that of the Irish Victor.

Six-rowed Barley. The area devoted to the barley crop in Ontario has increased from 438,784 acres in 1898 to 734,029 acres in 1908. No other grain crop has increased in area to such a great extent during the last ten years as barley. This is undoubtedly due, to a certain extent, to the introduction by our College of the Mandscheuri barley, and after testing it at Guelph and finding its excellent characteristics, distributing the same throughout Ontario through the medium of the Experimental Union. The Mandscheuri barley has thus been distributed throughout Ontario each spring since 1892. As nearly as we can ascertain, there are about 550,000 acres of the Mandscheuri variety grown in Ontario at the present time. No. 21 barley is a selected strain of the Mandscheuri which we started at the College a few years ago. It has been distributed throughout Ontario, and although it does not give very marked differences from the Mandscheuri variety, it has, on the whole, given slightly better returns. In the report of the co-operative experiments over Ontario in 1907, No. 21 barley slightly surpassed the Mandscheuri variety in yield of grain per acre, strength of straw, freedom from rust, early maturity, and in general popularity. In 1908, it again surpassed the Mandscheuri in yield of grain per acre, but in general popularity it was very similar to that variety. The No. 21 barley has a fine appearance, and usually stands up rather better than the Mandscheuri. It is certainly a very excellent strain of barley. The Oderbrucker variety, which has been one of the closest rivals which we have had to the Mandscheuri is again surpassed by that

variety, as is the case in practically all experiments, both at the College and throughout Ontario.

Two-rowed Barley. The interest taken in two-rowed barley throughout Ontario is not great, as may be seen from the fact that we have more than four times as many good reports from the six-rowed as we have from the two-rowed varieties for 1908. It will be seen from the tabulated results that the highest yielding variety of two-rowed barley gave an average yield of nearly seven bushels per acre less than the No. 21 six-rowed, and over seven bushels per acre more than the Two-rowed Canadian, with which it was compared in the co-operative tests. Of the two-rowed barleys which we have grown at the College, the Hanna, which is a Russian variety introduced by the Department of Agriculture of the United States, has proven itself to be one of the very best kinds. It was distributed in connection with our co-operative work in 1908 for the first time.

Hulless Barley. Fully a dozen varieties of hulless barleys have been under experiment at the College. The Black Hulless is the oldest and best known variety in Ontario. It is, however, very weak in the straw and has not given as good results in yield of grain per acre as the Guy Mayle variety in the experimental work at the College. It will be seen from the average results of growing both the Black Hulless and the Guy Mayle in ten different localities throughout Ontario in 1908, that decidedly the greatest yield per acre was produced from the Guy Mayle variety, which was also very popular with the experimenters.

Spring Wheat. The three varieties of wheat distributed in the spring of 1908 represent two classes of grain. The Wild Goose is a durum wheat and is specially suitable for the production of macaroni, while the Hungarian and the Red Fife varieties are finer grained wheats which are used more extensively for flour production. The Hungarian wheat was secured from the Argentine Republic, and has given exceptionally high results at the College amongst the finer quality wheats, It was distributed throughout Ontario in the spring of 1908 for the first time. In the average of fifteen carefully made tests of spring wheat throughout Ontario in 1908, it will be seen that the Wild Goose heads the list in yield of both grain and straw, and also in popularity. It is followed by the Hungarian, which has given slightly better all-round results than the Red Fife. These results correspond almost exactly with those obtained at the College with these three leading varieties of spring wheat. The Red Fife is well known throughout Ontario, and the Western Provinces of Canada, and needs no description, but forms a good standard with which to compare the other varieties.

Buckwheat. Although there is usually not as great a demand for buckwheat for experimental purposes as with most of the other crops, it will be seen that we have eight good reports of experiments conducted with this crop throughout Ontario during the past season. The Silver Hull buckwheat has been grown at the College for many years with very good results. The Rye, Sand, or Notched buckwheat, although considerable grown in some countries, has not been used in the experiments at the College until within the last few years, during which time it has surpassed the Silver Hull in yield of grain per acre. The Rye buckwheat was distributed throughout Ontario this year for the first time, and the results show that it surpassed the Silver Hull variety in yield of grain per acre by more than five bushels and also that it surpassed the Silver Hull in popularity with the experimenters. The Rye buckwheat is grown quite extensively in the Province of Nova Scotia.

Emmer and Spelt. These represent two classes of wheat which have been studied more particularly for the production of feed for farm stock than for the production of flour. When threshed there is not a clear separation of the grain and the chaff, but both come from the machine together and are afterwards ground into meal. The Emmer usually possesses about 22 per cent. of hull or chaff, and the Spelt about 30 per cent. It will therefore be seen that the amount of hull on the Emmer is considerably less than that on the average variety of oats, which usually runs about 30 per cent. Emmer and Spelt have been distributed throughout Ontario for co-operative experiments in each of the past five years, the following being the yields per acre from the two varieties respectively: 1904, 2,274 lbs., 1,263 lbs.; 1905, 1,589 lbs., 1,276 lbs.; 1906, 1,578 lbs., 1,106 lbs.; 1907, 1,768 lbs., 952 lbs.; and in 1908, 1,731 lbs., and 1,002 lbs. It will therefore be seen that the Emmer has surpassed the Spelt in yield of grain per acre to a very marked extent. In both the experiments at the College and also throughout Ontario, the Common Emmer forms a very close rival indeed to the best varieties of oats and the best varieties of barleys in yield of grain per acre. In fact Emmer has surpassed both of these grains on several occasions.

Winter Wheat. Three varieties of winter wheat were distributed last autumn to those farmers who wished to test some of the leading varieties on their own farms. The Imperial Amber was distributed for the ninth time, the Abundance for the second time, and No. 5 Red for the first time for these co-operative experiments. Not only did the Imperial Amber give the greatest yield per acre in the co-operative experiments throughout Ontario in 1908, but it also came first in popularity with the experimenters. This variety has produced very excellent results in the experiments at the College. Dawson's Golden Chaff, which we distributed for the co-operative experiments in each of twelve years, and which is probably grown more extensively in Ontario at the present time than all other varieties of winter wheat combined, has not been included in the co-operative tests since 1906.

Winter Rye. Winter Rye has proved to be a very hardy and good yielding crop at the College. The Mammoth White variety has given very good results indeed. It will be seen from the co-operative experiments over Ontario in 1908, that the Mammoth rye has also made an excellent record, with an average of 34 bushels, while that of the common rye gave 28.6 bushels per acre. It must be remembered, however, that the number of successfully conducted experiments is not large, being only five in 1908.

Field Peas. For a few years, we distributed field peas only to those districts where the pea weevil has not yet been found, but in 1906, and in each of the two following years, owing to the fact that the pea weevils were becoming less troublesome, it was decided to send peas for experimental purposes to all parts of the Province from which applications were received. Consequently, we received for this experiment fifty-five good reports in 1906, forty-two good reports in 1907, and fifty-three good reports in 1908. These reports are more numerous than those obtained for the few years previous to 1906. On averaging the results of the fifty-three good reports which came to hand this year, we find that the New Canadian Beauty stands first in yield of grain with an average of 27.35 bushels per acre, which is followed by the Early Britain with an average of 25.06 bushels per acre. We have compared these two varieties over Ontario in each of six previous years, and the average results show that in five of these years the Early Britain surpassed the Canadian Beauty variety in yield of grain per acre. This variety, however, gave unusually low results in 1908, when compared with the New Canadian Beauty. The New Canadian Beauty is a large

white pea of good quality and is very saleable. The Early Britain variety is brown in color, and not as round in the grain as the New Canadian Beauty. It will be noticed that the best variety of peas surpassed the best variety of oats and barley in the experiments throughout Ontario in 1908. This was also true in 1907, but in 1906, the barley and the oats considerably surpassed the peas in yield of grain per acre.

Field Beans. The field beans gave very good results throughout Ontario in 1908, the Marrowfat variety giving upwards of 26 bushels of grain per acre. Although this variety surpassed the White Wonder by nearly one bushel per acre, it was not as popular with the experimenters as the last named variety. The Marrowfat produces large white beans, and both the White Wonder and the New Prize Winner, small white beans.

Corn for Grain. There are in Ontario about three hundred thousand acres used each year for the growing of corn for the production of grain. This area is still rather larger than that devoted to the corn for fodder and for silage purposes. It will be seen that of the three varieties used for the experiment throughout Ontario, in 1908, the King Philip gave the greatest yield, the average for this variety being 46.3 bushels per acre, as compared with 43.2 for the Compton's Early, and 38.8 for the Genesee Valley, according to the reports furnished from seventeen different localities. We have used the King Philip and the Compton's Early for the co-operative experiments in each of eight years, in the majority of which the King Philip took the lead in yield per acre. In the average of the eight years, however, the difference was not very marked, being about one-half bushel per acre per annum in favour of the King Philip variety. It will be seen from the results for this year that the Compton's Early was more popular with the experimenters than the King Philip. This is probably due to the fact that the ears of the Compton's Early are usually quite uniform, especially in their yellow color. The grain of the King Philip variety has a distinctly reddish cast when it is thoroughly ripened, but this is not the case with the immature grain; hence the King Philip is not always uniform in color, especially when the ears are freshly husked. The Genesee Valley is a very early, yellow flint corn which has been giving good results at the College and in some parts of Ontario. It is one of the best of the very early varieties of corn.

Mixtures for Grain Production. Within the past fifteen years, a large amount of work has been accomplished at the Agricultural College in determining the comparative results from growing grains in mixtures as against the growing of the same kinds of grains separately. A study has also been made of the various classes and varieties of grain, in order to ascertain which kinds can be mixed together for the best results for green fodder, hay, and grain production. For the details of these results, the reader is referred to the Annual Reports of the Ontario Agricultural College. For the production of grain, experiments show that when different classes of grain have been mixed together, they have yielded more heavily in nearly all cases than when grown separately. Of the various classes used, the highest yield has been obtained from oats and barley. Of the different varieties which have been included in this experiment, the mixture of Mandscheuri barley and Daubeney oats has been one of the most satisfactory up to the present time. We are at present endeavouring to originate a new variety of barley through hybridization, which will possess the good characteristics of the Mandscheuri barley, and at the same time will be about ten days later than that variety, and will thus mix nicely with the Siberian, Banner, or other variety of oats which are medium in date of maturity.

For four years in succession, we have used three different mixtures of grain in order to compare the results of these mixtures throughout the Province, and in order to give the farmers a better opportunity to study the results of the same. The mixtures have been the same in each of the four years. It is interesting to know that the combination of Mandscheuri barley and Daubeney oats has given the greatest yield of grain per acre in each of the four years. In 1908, this mixture gave 174 pounds more than the Siberian oats and Two-rowed Canadian barley, and 260 pounds more than the mixture of Siberian oats, Two-rowed Canadian barley and Wild Goose spring wheat. In each of the four years, the Mandscheuri barley and the Daubeney oats has been decidedly the most popular with the experimenters. It is only within the last year or two that the Bureau of Industries at Toronto has collected statistics regarding the area devoted to mixed crops in this Province. We notice that in 1908 no less than 456,049 acres were devoted to mixed grains. This area is almost as great as that for the cultivation of corn for fodder, silage and grain production.

Varieties of Potatoes.

According to the November report of the census and statistics office of the Department of Agriculture, at Ottawa, we learn that in 1908, the area devoted to potato growing in Ontario was greater than the combined area used for the growing of potatoes in Nova Scotia, New Brunswick, Prince Edward Island, Manitoba, Saskatchewan, and Alberta. We also learn that the estimated value of the potato crop grown in Ontario in 1908 was slightly over twelve million dollars. It will therefore be seen that the potato crop is an important one in this Province. If the farmers of Ontario would select a few of the very best varieties of potatoes and grow those varieties almost exclusively for their general crop, the products would be more uniform and better prices would be realized. In connection with the co-operative experiments in 1908, the various experimenters were asked to furnish the names of those varieties which were most extensively grown in their counties. As a result of this inquiry, we received four hundred and five replies, and no less than ninety varieties of potatoes were named, some experimenters mentioning two, three, or four varieties. Of the ninety varieties referred to, each of seventy-one of them was mentioned less than five times. Those which were mentioned for more than ten times are as follows:—Rural New Yorker, 57; Empire State, 42; White Elephant, 30; Beauty of Hebron, 30; The two Carmans, No. 1 and No. 3, taken together 28; American Wonder, 27; Early Rose, 24; and Early Ohio, 15. The seven varieties which were mentioned from five to nine times are as follows: Delaware, 9; Bovee, 8; Burbank's Seedling, 6; Green Mountain, 6; Irish Cobbler, 6; Six Weeks, 6; and Sir Walter Raleigh, 5. The Experimental Union has distributed five out of the nine varieties which are apparently now grown the most extensively throughout the Province. It is interesting to note that in response to the inquiry made as to the most extensively grown potatoes in 1907, exactly the same nine varieties as are here named were mentioned the greatest number of times, but the order of these nine varieties is slightly different. In each of the years, however, experimenters referred to the Rural New Yorker as the most extensively grown throughout the Province, and the Empire State as the second variety in this particular.

In the spring of 1908, the Experimental Union distributed two varieties of late potatoes, three varieties of medium potatoes, and seven varieties of early potatoes for experimental purposes. Only two varieties were sent

to each experimenter, but in each group of potatoes one variety was distributed throughout and used as the basis of comparison in summarizing the results. A very large number of applications were forwarded to us and no less than 468 valuable reports of successfully conducted experiments were received this autumn, besides a large number of others, many of which contained good information, but through some cause or other could not be used in the summary. The following table gives the average results of the co-operative experiments with varieties of potatoes conducted on four hundred and sixty-eight farms throughout Ontario in 1908.

POTATO EXPERIMENT.

Experiments.	Potatoes.	Comparative Value.	Per cent. of small tubers.	Mealiness when cooked.	Bushels of whole crop per acre.
Late Varieties..... (127 tests)	Dempsey's Seedling.....	94	9	94	175.68
	Empire State	100	9	100	174.61
Medium Varieties. (98 tests)	Burpee's Extra Early.	100	10	100	155.36
	Rose of the North.....	90	13	98	143.03
	Green Mountain	97	9	94	135.92
Early Varieties.... (243 tests)	Early Puritan.....	100	12	99	132.95
	Extra Early Eureka.....	86	14	100	130.60
	Early Fortune	80	14	96	121.71
	Early Dawn	71	15	92	113.86
	Early Andes.....	80	12	94	111.65
	Early Pinkeye...	54	17	68	80.53
	Stray Beauty.....	42	24	75	55.48

It will be observed from the table that the results from the Dempsey's Seedling and the Empire State varieties are very similar. The Dempsey's Seedling has a slight advantage in yield per acre, and the Empire State was slightly more popular with the experimenters and produced potatoes a little better in mealiness than those produced by the Dempsey's Seedling variety. These two varieties were tested throughout Ontario in 1905 and again in 1906. In the average of those two years the Dempsey's Seedling was slightly higher than the Empire State in yield of tubers per acre. Both the Empire State and the Dempsey's Seedling have given very excellent results in the experiments at Guelph, and we have found that in comparing them with other late varieties throughout Ontario, that they take the lead in nearly all experiments. As the Empire State potatoes are white, they are probably rather more saleable in the markets of Ontario than those of the Dempsey's Seedling which have a slightly rose color.

Of the three varieties of medium ripening potatoes tested over Ontario during the past year, the Burpee's Extra Early again takes the lead. Not only has it produced a greater yield per acre, but it was also higher in popularity and produced potatoes which were better in mealiness than either of the other two varieties belonging to this class.

No less than two hundred and forty-three good reports of early potatoes were received in the autumn of the present year. Although the Early Puritan is not a new variety, it was distributed throughout Ontario in connection with our co-operative experiments in 1908 for the first time, and has made a very good record indeed, producing a high yield of potatoes of good quality. The Extra Early Eureka variety of early potatoes was used in connection

with the co-operative experiments in 1907 for the first time, in which year it took the lead in yield per acre. The potatoes are white in color, smooth and compact in form, and are of excellent quality. The Early Fortune, which is a flat, oval potato, of a rosy color, has been used in the co-operative experiments in each of five years. In 1904, it was second; 1905, first; 1906, second; 1907, third; and 1908, third on the list of the early varieties in yield of tubers. The Early Dawn gave a slight increase over the Early Andes in 1908, but in 1907 the Early Andes surpassed the Early Dawn in yield per acre to a small extent. The Early Pinkeye and the Stray Beauty gave the lowest yields per acre in 1908 as in 1907.

Taking the results of the co-operative experiments, both for this year and for other years into consideration, we find that those varieties which have made excellent records throughout Ontario in producing large yields of potatoes of good quality are the Empire State and the Dempsey's Seedling of the late varieties, the Burpee's Extra Early and the Rose of the North of the medium ripening varieties, and the Extra Early Eureka and the Early Fortune of the early varieties.

Sweet Corn for Home Use.

Upwards of fifty varieties of sweet corn have been tested at the Agricultural College for productiveness and for table quality. There is a great variation in the different varieties in stage of maturity, in the size and the color of the ears, in the flavor and the juiciness of the grain, etc. Sweet corn for table use is greatly relished by many people throughout Ontario. In order to encourage this use and to allow the farmers to secure some of the very best varieties, and to ascertain for themselves which kinds would prove most suitable for cultivation for home use, a few of the choice varieties have been selected for co-operative experimental work. In the spring of 1908, three varieties were distributed for testing throughout Ontario. The following table presents the average results of the experiment of the three varieties of Sweet corn tested for home use on thirty-three Ontario farms:—

Experiment.	Varieties.	Comparative value.	Number of ears.	Number of days until ready for table use.	Table Quality.	
					Flavor.	Juiciness.
Sweet Corn (33 tests)	Golden Bantam.....	100	152	86	100	100
	Mammoth White Cory.	97	158	82	76	77
	Malakhoff.....	57	152	84	66	74

The Malakhoff variety of sweet corn was introduced from Russia into the United States through the Department of Agriculture at Washington, and has been tested at a number of the Experimental Stations. It has been grown at the Ontario Agricultural College in each of the past five years, and was distributed for co-operative experimental work throughout Ontario in 1908 for the first time. The Mammoth White Cory sweet corn has been grown in Ontario for a number of years, and is one of the best known varieties in the Province. Of all the varieties of sweet corn which have been tested at the Ontario Agricultural College, the Golden Bantam is the favorite

variety for the table. The ears are rather small, yellow in color, and possess eight rows. The corn is exceedingly tender and possesses an excellent flavor. In the co-operative experiments over Ontario for 1907, the Golden Bantam was reported by the experimenters as possessing the best table quality and as being the choice of the varieties tested for home use. It will be seen from the foregoing table that it has also made an excellent record in 1908, occupying the highest place in both flavor and juiciness, and also in the comparative value, when all points are taken into consideration.

Field Roots, Fodder Plants, and Hay Crops.

Under this heading, experiments were conducted during the past year with mangels, sugar beets for feeding purposes, swede turnips, fall turnips, carrots, corn for fodder and for silage, millet, sorghum, grass peas, vetches, rape, kale, field cabbage, clover, Lucerne, Sainfoin, Burnet and grasses. The average results of the carefully conducted experiments with the most of these crops are presented in tabulated form, but it seems a difficult matter to get returns from grasses and clovers which can be tabulated, so as to be clearly understood. The following table is very interesting and furnishes a good opportunity of comparing the results of the various varieties as grown during a season such as we have had in 1908:—

Field Roots and Fodder Crops.

Experiments.	Varieties.	Comparative value.	Yield per acre (tons).
Mangels (7 tests)	Sutton's Mammoth Long Red	100	31.60
	Ferry's Yellow Leviathan	100	29.73
	Carter's Windsor Yellow Globe	97	28.58
Sugar Beets (7 tests)	Rennie's Tankard Cream	100	32.72
	Bruce's Giant White Feeding	81	31.57
Swede Turnips (3 tests)	Sutton's Magnum Bonum	70	24.16
	Carter's Invicta	100	22.15
	Steele-Brigg's Good Luck	73	18.59
Carrots (3 tests)	Bruce's Mammoth Intermediate White	100	14.87
	Steele's Improved Short White	92	14.39
Fodder Corn (4 tests)	Henderson's Eureka	100	15.63
	White Cap Yellow Dent	82	14.83
	Reid's Yellow Dent	73	14.33
Sorghum (3 tests)	Early Minnesota Sugar Cane	100	9.92
	Early Amber Sugar Cane	92	9.24
	White Kaffir Corn	46	4.87
Grass, Peas and Vetches (1 test)	Hairy Vetches	100	12.24
	Grass Peas	93	9 60
	Common Vetches	71	8.40
Rape, Kale and Cabbage (2 tests)	Sutton's Earliest Drumhead Cabbage	100	17.06
	Thousand Headed Kale	94	16.79
	Dwarf Essex Rape	88	16.47
			Hay.
Millet (6 tests)	Japanese Panicle	100	5.19
	Golden Wonder	87	4.93
	Hungarian	93	4.71

Mangels. The three varieties of mangels used in the co-operative experiments in 1908 represent three distinct types, viz., the long, the intermediate, and the globe. At the present time the intermediate mangels are grown much more extensively throughout Ontario than formerly. There are a large number of varieties of each of the three classes here mentioned, and according to our results at Guelph we find a considerable difference in the productiveness of the different varieties of each class. During the past two years we have obtained very excellent results from the Yellow Leviathan, which belongs to the yellow intermediate class. Previous to 1908, it gave the greatest yield of roots per acre of the different varieties used in the co-operative experiments throughout Ontario in each of four years. It will be observed that in 1908 it was surpassed by the Sutton's Mammoth Long Red by an average of nearly two tons per acre. Previous to 1908, the Yellow Leviathan was the most popular variety distributed in each of four years.

Sugar Beets. The Giant White Feeding variety of sugar beets was compared with the Royal Giant in 1905 and again in 1906, and with the Tankard Cream in 1907 and in 1908. In each of the past three years the Giant White Feeding has given the greatest yield of roots per acre in the co-operative experiments throughout Ontario. In 1908, however, this variety was surpassed by the Tankard Cream both in yield and popularity. According to the chemical analyses at the College, the Giant White Feeding has given an average of 7.8 per cent. sugar in the average of six years, and the Tankard Cream 8.9 per cent. sugar in the average results for five years. The Tankard Cream variety has certainly made a good record in the co-operative experiments for 1908.

Swede Turnips. Owing to the dry, warm autumn, the growth of swede turnips was comparatively light, and the ravages of the plant lice were unusually great this year. We have the reports of only three successfully conducted experiments with swede turnips for the past season. The Sutton's Magnum Bonum has been included as one of the varieties in the co-operative experiments in each of the past five years, and has produced the greatest yield per acre of the three varieties distributed in each of these years with the exception of 1907, at which time it was surpassed by the Carter's Invicta by an average of three-quarters of a ton of roots per acre. The Carter's Invicta seems specially suitable for the production of roots for shipping to the American markets for table use. It has been selected as one of the choice varieties for this purpose amongst all the varieties tested at the College. It will be observed that, although the Sutton's Magnum Bonum gave a larger yield than the Carter's Invicta in the average results for 1908, the latter named variety was the most popular with the experimenters.

Fall Turnips. Owing to the continued dry warm weather over a considerable amount of Ontario during the past autumn, the experiments with varieties of fall turnips proved to be of but little value, and no results of this experiment are presented in the tabulated statement.

Carrots. It will be observed that Bruce's Mammoth Intermediate Smooth White Carrot again made a good record in the co-operative experiments in 1908. It was, however, followed very closely indeed by the Steele's Improved Short White. Both of these are excellent varieties of carrots which have made good records at the College as well as throughout Ontario.

Fodder Corn. The Henderson's Eureka variety of corn has been a very heavy yielder of fodder in the experiments at the College. It is one of the very best of the large late varieties of fodder corn which has been under experiment. The White Cap Yellow Dent and the Reid's Yellow Dent are both somewhat earlier than the Eureka, but produce lighter yields per acre.

In comparing Henderson's Eureka and the White Cap Yellow Dent over Ontario for four years in succession, it is found that 17.8 tons represents the average yield of green crop per acre of the former and 14.5 tons of the latter. Usually, the White Cap Yellow Dent is a very popular variety throughout Ontario. Owing to the exceptionally warm and late autumn of 1908, however, the Henderson's Eureka had more than a usual opportunity for development. It is a variety which is more particularly suitable for the warm, sharp soils bordering on the lakes of the southern part of Ontario. In the greater part of the corn growing districts of this Province, the White Cap Yellow Dent has been giving very good satisfaction indeed.

Sorghum. A considerable number of sorghums, including different varieties of sugar cane, broom corn, kaffir corn, milo maize, Jerusalem corn, etc., have been grown at the College for several years in succession. Some of these, and especially the sugar canes, have given good results. In some localities throughout Ontario, sugar cane has been grown with a considerable amount of satisfaction as a fodder crop. The results of the co-operative experiments over Ontario in 1908 are rather lower than usual, as the highest average yield was only 9.9 tons per acre, while that of the highest yielding fodder corn was 15.6. There is usually not as great a variation in the production of the two crops as is here indicated. In the average of five years' testing of the Early Amber Sugar Cane and the Kaffir Corn throughout Ontario, the former has produced 14.3 and the latter 9.6 tons of green crop per acre. The sugar cane is greatly relished by animals, and its cultivation is practised in some localities.

Grass Peas and Vetches. The Hairy Vetches which gave 12.2 tons of green crop per acre in 1908, produced 9.2 tons in 1907, 7.9 tons in 1906, 8.9 tons in 1905, and 5 tons in 1904. The Hairy Vetches, Common Vetches and Grass Peas have been tested over Ontario for a number of years under uniform conditions. The average results show that the Hairy Vetches gave the greatest and the Common Vetches the lowest yield of green crop per acre. Much has been said regarding the growing of Hairy Vetches in the United States and in Canada, but owing to the fact that the seed usually costs fully $5.00 per bushel, and that it requires from one to one and a half bushels of seed to sow an acre, it is doubtful if this will become extensively grown as a fodder crop in Ontario, unless seed can be obtained at a less cost per bushel. Grass Peas make a very good fodder crop and can sometimes be used for this purpose to advantage.

Autumn Sown Hairy Vetches and Winter Rye. In each of five years the seed of Hairy Vetches and of Winter Rye was distributed throughout Ontario for co-operative experiments in testing these crops for fodder purposes. In the average of the five years' experiments, the Hairy Vetches produced slightly the largest yield of green fodder per acre, but in 1908 the largest yield was produced by the Winter Rye.

Rape, Kale, and Cow Cabbage. In each of the past five years, twenty-five varieties of rape, kale, field cabbage, Brussels sprouts, etc., have been grown in the Experimental Department at the College. In these results the Sutton's Earliest Drumhead cabbage has given the highest average yield of green crop per acre, when the seed was sown and treated in exactly the same way as that of rape. In a similar experiment, the Thousand Headed kale has given the second highest yield of green fodder per acre. In the spring of the present year, the Sutton's Earliest Drumhead cabbage was incorporated in the work of the Experimental Union for the first time. The demand for the seed of the cabbage, kale and rape was very limited in the spring of the present year, but the results of the two good reports of success-

fully conducted experiments show that the field cabbage gave a yield of one-half ton more of green crop per acre, and was rather more popular with the experimenters than the Dwarf Essex rape.

Millet. Six co-operative experimenters reported on the hay production of each of three varieties of millet used for these experiments during the present year. It will be seen that the Japanese Panicle has again made an excellent record, both in the production of hay and in the estimation of those who conducted the test, in comparing this variety with the Golden Wonder millet and with the Hungarian Grass. The Japanese Panicle and the Hungarian Grass have been tested in connection with the Experimental Union work for the last ten years, and it is found that the former has surpassed the latter in yield of green crop pr acre by twenty-five per cent.

Clovers. The Common Red, Alsike, and Mammoth Red varieties of clover are distributed for co-operative experiments each year. As the Common Red usually produces two crops in the one year, and each of the others one crop per season, and as the Common Red is not apt to survive the second winter as well as the Mammoth Red, it is difficult to get accurate results which will form a good summary report. The experiments with these crops, so far, have been chiefly valuable to the individuals conducting them.

Alfalfa, Sainfoin, and Burnet. Another experiment from which it is exceeding difficult to get data which can be placed in tabulated form is the one with the three perennial crops, Alfalfa, Sainfoin, and Burnet. As these produce a varying number of crops per year, and as the crops of the different varieties are ready for cutting at different dates, it is very difficult for the various co-operative experimenters to secure thoroughly reliable yields of these crops under similar conditions of maturity, moisture, etc. Our past experiments show that of these three crops, the Alfalfa, or Lucerne,is decidedly the most popular for hay production. In growing Alfalfa at the College in each of 11 years, from 1896 to 1908, the average yield of green crop per acre has been 21.5 tons, and the yield of cured hay per acre has been 5.2 tons. There has been an average of three cuttings per annum or of thirty-three cuttings during the eleven years. Our co-operative work shows that Alfalfa can be grown successfully on many of the farms of Ontario where the land is suitable, but it should always be remembered that Alfalfa requires land with a subsoil which is well underdrained, either naturally or artificially. The experiments at the College have shown that Turkestan Alfalfa seed, which has been imported, has given high results, but that the seed obtained through the American trade, under the name of Turkestan Alfalfa, has given poor satisfaction. The Experimental Union was fortunate in securing through the Department of Agriculture of the United States, a quantity of Tukestan Alfalfa. In the spring of the present year this was distributed to the experimenters along with the Common Alfalfa seed for co-operative experimental work. The experimenters were asked to state in their reports which of these two strains of Alfalfa gave the best appearance about the middle of October of the present year, and practically all of the farmers have reported that the Turkestan Alfalfa was better in appearance than the Common variety when examined in the autumn. The results of these experiments will be watched with interest in the future.

Grasses. The varieties which have been distributed during the last few years are as follows:—Tall Oat, Timothy, Orchard Grass, Awnless Brome, Tall Fescue, Western Rye and Lyme Grass. The Tall Oat grass not only gave the largest yield of hay per acre in 1908, but also gave the greatest yield of hay per acre in the average results of all the reports received within the last four years. It is unfortunate that the seed of the Tall Oat grass

is expensive. There are many excellent object lessons and much valuable information obtained from the co-operative experiments with the different varieties of grasses in studying their adaptability to the different soils and their comparative usefulness for pasture as well as for hay production.

Fertilizers with Farm Crops.

The fertilizer experiments are among the most difficult to conduct in field plots, either at an experiment station or throughout the country. Soils vary greatly in their composition, crops vary largely in the amount of plant food required and in their power of making use of the same from the soil, and fertilizers themselves vary, to a marked degree, in both the amount and the availibility of plant food which they contain. At some experiment stations, such as that established by Sir. J. B. Lawes and Sir Henry Gilbert at Rothamsted, England, the Royal Agricultural Society at Woburn, England, and the State Experiment Station at Wooster, Ohio, elaborate and long continued fertilizer experiments have been conducted at a great expense, the results of which are valuable in furnishing certain information. While it is true that valuable experimental work can be conducted with fertilizers at an experiment station, it is also true that many of the results cannot be used as a direct and sure guide for the farmer on his own particular farm. If, however, elaborate experiments with fertilizers are planned for the farmers to conduct, they will find the work and the expense to be beyond their reach. Realizing this fact, some comparatively simple experiments were arranged in connection with the Experimental Union, sixteen years ago. While it is true that these experiments have not accomplished all that we would like to have fertilizer experiments accomplish, the same can be said regarding every fertilizer experiment in field plots which has ever been conducted in any part of the world. The table gives a summary of all the experiments conducted through the medium of the Experimental Union within the past sixteen years, including the tests of fertilizers with winter wheat in 1908 for the fifth year, and those with potatoes for the second year.

Kind of fertilizer used.	Fertilizer per acre.		Oats.	Winter wheat.	Fodder corn.		Mangels	Swede turnips.	Potatoes
					Total.	Ears.			
	Weight.	Cost.	5 years 74 tests.	5 years 15 tests.	8 years 47 tests.	8 years 41 tests.	5 years 41 tests.	3 years 11 tests.	2 years 38 tests.
	lbs.	$ c.	bus.	bus.	tons.	tons.	tons.	tons.	bus.
Nothing	.....	.....	38.9	19.9	8.2	2.7	20.6	21.2	134.4
NitrateofSoda	160	4 80	46.3	23.8	9.4	3.1	26.5	25.2	163.1
Muriate of Potash	160	4 00	43.8	22.9	9.4	3.0	24.6	25.6	170.2
Superphosphate	320	3 92	43.6	22.7	9.0	3.1	24.2	26.6	168.9
Complete Fertilizer	213	4 24	48.7	25.2	9.4	3.2	25.4	28.5	180.9
Potato Fertilizer	320	5 52	.....	.....	.....	.....	.....	.....	176.5
Royal Canadian	320	5 60	.....	.....	.....	.....	.....	.....	173.0
Cow Manure	40,000	6 00	.....	27.1	.....	.....	.....	30.3	187.1

In each of the years, both the fertilizers and the seeds have been sent from the College to the experimenters. In every instance, the nitrate of soda and the muriate of potash have been applied at the rate of 160 pounds per acre, and the superphosphate at the rate of 320 pounds per acre. The mixture of complete fertilizer has been composed of one-third the amount of these fertilizers, making in all 213 1-3 pounds. Both the Royal Canadian and the potato fertilizer used in 1908 with the potato crop, were applied at the rate of 320 pounds each per acre. In all cases, the nitrate of soda has been applied when the plants were about three inches in height, and all the other fertilizers at the time of sowing the seed. Farmyard manure has been used in the experiments of the past seven years. The advice of each experimenter has been to apply 500 pounds of average cow manure per plot, the application being equal to twenty tons per acre. The cow manure has been mixed with the soil to a depth of from four to five inches, and the fertilizers have been stirred in the soil to a depth of from one to two inches.

In connection with the co-operative work, experiments have been conducted throughout Ontario with fertilizers on oats for five years, winter wheat for five years, fodder corn for eight years, mangels for five years, swede turnips for three years, and potatoes for two years. The reports for 1908 are confined to the experiments with fertilizers with winter wheat, and with potatoes.

The cost of each fertilizer, as given in the table, represents very closely the present cost per acre for the fertilizers as used in the co-operative experiments. The quotations were based on the factory prices for quantities of one ton in each case. The twenty tons of cow manure would mean about twelve good sized loads per acre, and manure in Guelph has been selling at 50 cents per load, which is probably about the average for the province. It is exceedingly difficult to place a price on farmyard manure, as in most cases it is not purchased but is produced on the farm. Each person may place such value on the manure as he deems expedient, and study the results according to his own circumstances. It should be remembered that the freight on the fertilizers and the application of both the fertilizers and the manure are not taken into consideration in the foregoing statement, nor yet is there any account made of the future influence of the different fertilizers and the manure upon the land.

Fertilizers with Oats. Seventy-four good reports of successfully conducted experiments in applying fertilizers to oats were received during the five years in which this experiment was conducted over Ontario. The lowest average yield was obtained from the unfertilized land, 38.9 bushels per acre; and the highest average yields from the mixed fertilizer, 48.7 bushels; and the nitrate of soda, 46.3 bushels per acre. The unfertilized land produced the lowest yield per acre in each of the five years. The mixed or complete fertilizer gave the largest yield of oats per acre in the average results of this experiment in each of the five years in which it was conducted. Although the land which received the mixed fertilizer gave an average of 9.8 bushels of oats per acre more than the unfertilized land, still this increase was produced at a cost of about 42 cents per bushel, according to the present prices of fertilizers. It will therefore be seen that it is only in special years that the commercial fertilizers will give economical results with oats on the average land of Ontario. The mixed fertilizer gave a larger average yield than no fertilizer on heavy soils by 12.7 bushels per acre, on light soil by 10.2 bushels per acre, and on black mucky soils by 7.1 bushels per acre.

Fertilizers with Winter Wheat. In the co-operative experiments with different fertilizers applied to winter wheat, it will be seen that the greatest average yield per acre was produced from the application of cow manure. The complete fertilizer, however, when applied at the rate of only 213 pounds per acre, gave less than two bushels per acre below the cow manure. It will be observed that the land which received the complete fertilizer gave 5.3 bushels per acre more than that which received no fertilizer. In 1908, the results were in exactly the same order as those given for the average of five years, with the exception that the nitrate of soda gave about one-quarter bushel per acre less than the muriate of potash in the average of the six experiments. According to the prices of fertilizers given in the table, the most economical increase in yield of winter wheat was made by the application of the mixed fertilizer, and even in this case the cost of the increased yield amounted to 82 cents per bushel.

Fertilizers with Corn. In the average of experiments in applying fertilizers with corn in each of eight years, during which time forty-seven complete and satisfactory reports were received, it will be seen that the yields of whole crop produced by the plots which received an application of nitrate of soda, muriate of potash, and mixed fertilizer, were equal, while a plot on which superphosphate was applied produced nearly half a ton less than the others, and that the largest yield of husked ears was obtained when the mixed fertilizer was applied to the land. The muriate of potash produced the corn at the least cost per ton, but even with this fertilizer it cost $3.33 on the average to produce each additional ton of fodder corn.

Fertilizers with Mangels. During the five years in which fertilizers were used with mangels, forty-one good reports of successfully conducted experiments were received. These show that the smallest average yield was produced from the unfertilized plot; viz., 20.6 tons per acre, and that the largest average yield was produced from the nitrate of soda; viz., 26.5 tons per acre. As in the case with corn, the unfertilized land gave the lowest yield in each year. The nitrate of soda produced the highest yield in four out of five years. The average of 197 bushels of mangels per acre, produced by the nitrate of soda over the unfertilized land, was obtained at a cost of about 2.4 cents per bushel. The nitrate of soda produced the largest yield on both heavy and light soils, but on the black loams the muriate of potash gave the highest yield of mangels. The nitrate of soda showed the greatest influence upon the light soils, as in the average of fifteen experiments the sandy land which was fertilized at the rate of 160 pounds of nitrate of soda per acre gave an average yield of 7 2-3 tons per acre more than the land which was unfertilized.

Fertilizers with Swede Turnips. On averaging the results given in all the reports of the test of fertilizers with swede turnips, we find that barnyard manure has been instrumental in producing the largest yield of roots, and that mixed fertilizer stands second in this respect. According to the prices given for the manure and the fertilizers in the foregoing table, the increased yield of turnips was produced at a cost of 66 cents per ton by the use of cow manure, and 82 cents per ton or 2.5 cents per bushel by the use of the mixed fertilizer.

Fertilizers with Potatoes. Thirteen different kinds of fertilizers were used with potatoes at the Ontario Agricultural College for five years in succession. In this experiment, the Royal Canadian fertilizer gave the highest, and the Potato fertilizer the second highest yield of tubers per acre. Another experiment was afterwards arranged and was also conducted

for five years in succession, and it was found that the highest average yield of potatoes was obtained from the use of a mixed fertilizer similar to the one used in connection with our co-operative work with other crops. This, however, was closely followed in yield by the Royal Canadian and by the Potato fertilizer. The last two are both complete fertilizers, each containing nitrogen, phosphoric acid and potash. The Royal Canadian fertilizer is sold by the Capelton Chemical Co., Buckingham, Que., and the Potato fertilizer by The W. A. Freeman Co., Hamilton, Ont. In the spring of 1907, and again in 1908, both potatoes and fertilizers were distributed from the College throughout Ontario. From these experiments, twenty-two good reports of successfully conducted tests were received in 1907 and sixteen in 1908. The average results of the two years' tests are presented in the foregoing tabular form. The results for the two years were very similar, running in exactly the same order throughout with the exception that the muriate of potash and the superphosphate changed places in the results of the two years, but the difference in yield was quite small in both cases. It will be seen that of the commercial fertilizers, the three complete manures gave the highest results, and of these, the mixture composed of 53 pounds of nitrate of soda, 53 pounds of muriate of potash, and 107 pounds of superphosphate gave a higher yield per acre than either the Potato fertilizer or the Royal Canadian. The highest yield of all was produced by an application of cow manure at the rate of 20 tons per acre. The land thus treated gave an average of 52.7 bushels per acre more than the land which received no application whatever.

According to the prices given in the table, the cost of the increase in bushels of potatoes per acre in the average of the two years' experiments was in each case as follows: Mixed fertilizer, 9.1 cts.; muriate of potash, 11.2 cts.; superphosphate and cow manure, 11.4 cts.; Potato fertilizer, 13.1 cts.; Royal Canadian fertilizer, 14 cts.; and nitrate of soda, 16.7 cts. In each of the past two years, the majority of the experimenters tested the potatoes grown from all the fertilizers and reported the results for both flavor and mealiness. It was found that the table quality was influenced but very slightly indeed by the fertilizers, there being only a variation of five or six per cent. in the average results in reference to the table quality. The highest average results from the use of fertilizers on nine sandy soils in 1907 were obtained by the Potato fertilizer, cow manure, and muriate of potash, and on ten experiments in 1908, by the Potato fertilizer, cow manure, and mixed fertilizer. On the clay loam and heavy clay soils, however, the highest average yield was produced by the cow manure and the Royal Canadian fertilizer in 1907, and by the cow manure, Potato fertilizer, mixed fertilizer and Royal Canadian in 1908. Much interest was shown in this experiment throughout.

Q.—How does the Hulless barley compare with Mandscheuri barley in feeding value?

Prof. Zavitz: I think the Hulless barley is slightly richer for feeding purposes than the Mandscheuri variety. We have in the Hulless barley a grain without a hull, as the name implies, while in the six-rowed varieties we have a grain with a hull of about 15 per cent., and of course the hull is not as valuable for feeding purposes as the rest of the grain.

Q.—Is the Hungarian wheat a bearded variety?

A.—Yes.

Q.—Do you test the Wild Goose wheat with the other varieties?

A.—Yes, the object being to compare the productiveness of the different wheats under uniform conditions.

Q.—Would you advise placing the Wild Goose wheat in the same class as other wheats for exhibition purposes?

A.—No, I do not think it would be fair. The Wild Goose spring wheat is a durum or macaroni variety. It has a large grain which is very hard. It would be very difficult, indeed, for a judge to know how best to place the awards if the Wild Goose is entered in the same class as other varieties of spring wheat, such as the Red Fife, Colorado, etc.

Q.—I have seen judges at a loss to know how to place the awards at some of the fall fairs when the Goose wheat has been entered in the same class as the others.

A.—I can very well understand that it would be a very difficult thing to know how to judge all of these wheats in the same class. The Wild Goose variety is particularly suitable for the manufacture of macaroni, and is frequently shipped out of our Province to foreign countries for the manufacture of macaroni. In some years we have been able to get a higher price for the Wild Goose than we have for our varieties of wheat for flour production. During the past few years, however, the price of the Wild Goose variety has been slightly lower than that of the finer wheats. The Wild Goose variety is more difficult to grind than other kinds of spring wheat grown in Ontario. It is a spring wheat of high gluten content, however, and the millers are now using it considerably for the production of flour to mix with that obtained from winter wheat, in order to improve the quality of the latter.

Mr. Carleton: Do you know whether Rye buckwheat is used for buckwheat flour?

A.—I think it is used for flour production in Nova Scotia. We are not as yet growing this variety as a general farm crop in Ontario. The Rye buckwheat is grown much more extensively in Nova Scotia than all other varieties combined.

Mr. Hubbard: It makes a yellow flour and it shells easily and ripens unevenly.

Prof. Zavitz: I have noticed that it ripens a little more unevenly than any of the other varieties. We have grown it at the College in each of the past five years, and in that period of time it has given an average yield per acre of 32.7 bushels, in comparison with 23.5 as the average annual yield per acre of the Silver Hull variety, under similar conditions. We intend to study this variety more carefully.

Q.—How do you tell Emmer from Spelt?

A.—Emmer possesses compact bearded heads, while the Spelt has a long open head and is nearly always beardless. The Emmer is exceptionally free from rust, while the Spelt usually rusts very badly. The Emmer produces a large yield of grain, while the Spelt gives very poor results in Ontario.

Q.—Is there any difference in the grain?

A.—After the crop is threshed, the most of the grain is still surrounded by the chaff, owing to the fact that the heads simply break up into their separate spikelets. If these spikelets are examined, it will be observed that they are very pointed at the base, in the case of the Emmer, and that they are broad and blunt in the case of the Spelt. This is always a distinguishing feature between the two kinds of grain.

Q.—Do you know anything of the Scotch Blue pea?

A.—We have grown both the Prussian Blue and the striped blue varieties, but have not tested a pea under the name of the Scotch Blue. I think likely they are a garden variety, and in the Department of Field Husbandry we deal more particularly with those varieties most suitable for growing as farm crops in Ontario.

A MEMBER: I sold a car load in Buffalo a short time ago. I think they must use them for soup. They went under the name of the Scotch Blue pea.

PROF. ZAVITZ: It is possible the Scotch Blue peas have been tested in the Horticultural Department here at the College. The yield of field peas throughout Ontario has been particularly good during each of the past two years. We hope the pea weevils have been reduced to such an extent that our farmers can grow peas once more with the same satisfaction as in former years.

Q.—Do you get as good results from oats and barley as you do from barley alone?

A.—We have obtained about two hundred pounds more grain per acre from oats and barley in combination than from either one grown separately, in the average results of duplicate experiments conducted in each of six years.

MR. W. L. SMITH: Would there not be a great deal of waste when peeling the Dempsey's Seedling variety of potatoes?

PROF. ZAVITZ: The waste would probably be a little more in the case of the Dempsey's Seedling than in that of the Empire State variety, which is a comparatively smooth potato.

PROF. MCCREADY: Have you sent out the Rural New Yorker No. 2 variety of potatoes for experimental purposes?

PROF. ZAVITZ: Yes, it is one of the varieties we have distributed for experimental purposes in former years. It has given excellent results in some localities, but not so good as the Empire State in other sections. From extensive inquiries made quite recently, I find that the Rural New Yorker No. 2 is the most extensively grown potato in Ontario at the present time, and that the Empire State stands second in general cultivation. Of the late varieties, I would emphasize the value of the Empire State and the Rural New Yorker No. 2 for cultivation in Ontario; of the medium early varieties, the Burpee's Extra Early and the Rose of the North; and of the early varieties, the Extra Early Eureka, Early Fortune, and Early Puritan varieties. Taking into consideration the results of the co-operative experiments of the last two years, the Early Eureka is coming to the front as a leading variety of the early potatoes. In mealiness it stands at the top of the list of the early kinds.

PROF. DEAN: I used to grow late potatoes in my garden, but lately I do not grow them at all because of the rot. Do you think it best to run the risk of rot?

PROF. ZAVITZ: In some seasons the late potatoes rot more than the early varieties, in others there is but little difference in the amount of rot from the two classes. In 1906, for instance, the percentage of rot from the early potatoes was fully as much as that from the late varieties, but in 1905 and in 1904, the late potatoes had a somewhat large percentage of rot than the early varieties. We must remember, however, that late potatoes nearly always yield considerably higher than the early varieties.

Q.—Would these potatoes all be through growing when they were dug?

A.—Yes, I would think that in all cases the potatoes would be matured when dug in the autumn of the present year.

Q.—As the Golden Bantam variety of sweet corn has rather a small ear, would you recommend its use?

A.—I certainly recommend the Golden Bantam sweet corn for home use very highly indeed. The corn is exceedingly tender and juicy, and possesses an excellent flavour. The size of the ears is very suitable for table use. We have tested about fifty varieties of sweet corn, not only in the field, but also for table use. The Golden Bantam has made a very high record as a garden corn, not only at the College, but also throughout Ontario.

PRES. CREELMAN: We have been trying corn on our tables for years, and we have never come across anything that at all compares with the quality of the Golden Bantam variety. There is as much difference between that corn and the ordinary corn which you get on the market, as there is between the Snow apple and the Ben Davis apple in quality. Last year when this corn was at its best, we entertained the Scotch Commission of thirty-two members at our table, and while the Old Country people are not accustomed to eating corn on the ear, it was very fortunate that Mrs. Creelman took the precaution to prepare a large quantity, because they were particularly fond of it. I would like to hear Prof. Hutt say something regarding the Golden Bantam corn.

PROF. HUTT: We have been growing the Golden Bantam corn for several years as a garden variety. We used to grow half a dozen varieties, but we now grow this variety almost entirely, by planting at different dates so that we can keep up the supply.

Q.—Do you ever grow Stowell's Evergreen variety?

PROF. ZAVITZ: We have grown Stowell's Evergreen variety of sweet corn in our experimental grounds for many years. It produces large ears and is used largely for use in canning factories. It has not the sweetness or the juiciness of the Golden Bantam, and is not so suitable for home use. I first obtained a few seeds of the Golden Bantam variety in an envelope some eight or ten years ago.

Q.—Have you any report as to growing it in Manitoba?

A.—I do not recall any experiments which have been conducted with the Golden Bantam corn in Manitoba. The summary results which we here present are confined entirely to the experiments which have been conducted in Ontario.

Q.—Were your experiments with turnips confined to this district?

A.—We had but few reports from the experiment in growing turnips in 1908. Those which are used in the summary were from Renfrew, Muskoka and Algoma, so you see that the experiments were pretty well distributed. The Carter's Invicta is a variety of turnips of excellent quality and is very suitable for shipping to the eastern cities for table use.

Q.—How do the returns of co-operative experiments compare with those obtained at the College?

A.—I have been greatly pleased in past years with the results of co-operative experiments throughout Ontario. They conform quite closely with those conducted at the College, although there are sometimes slight exceptions. The experimental work at the College forms the basis of the co-operative work throughout Ontario, and each line of work would be deficient without the help of the other. The co-operative experiments enable both the farmers and the workers at the College to ascertain which of the leading varieties in the extensive experimental work at Guelph would give the most satisfactory returns on the various soils throughout the Province. We find that in almost every case those varieties which give high results at the College make excellent records throughout Ontario.

Q.—Why do you select such large varieties as Henderson's Eureka and Reid's Yellow Dent corn?

A.—These varieties of corn are tested for the production of fodder for the silo, and the Henderson's Eureka variety has proven to be the best of the large late varieties, but of course, is only suitable for the warm, sharp soils of the southern part of Ontario, and more particularly along the lakes. The Reid's Yellow Dent is a most valuable variety in the United States. It also requires comparatively warm, early soils in Ontario.

PROF. GRISDALE: We cannot ripen Reid's Yellow Dent once in ten years at Ottawa.

PROF. ZAVITZ: There are not many varieties of very early dent corn which give satisfactory results. The Sterling White Dent, however, is a promising early variety. The White Cap Yellow Dent is one of the very best varieties of fodder corn for the older parts of Ontario. It produces a good yield of total crop per acre, is of good quality, and is comparatively early as a dent corn.

Q.—What is the appearance of the Japanese Panicle millet?

A.—The Japanese Panicle millet has an upright growth, a large development of leaf, and a spreading head. The plants grow tall and stand up well. The seed is of a dark shiny appearance. Some of our seedsmen in their catalogues give cuts of the Japanese Panicle millet and describe the Japanese Barnyard grass. They seem to have the millets very badly mixed. I have known in a number of instances of farmers ordering Japanese millet and getting the Barnyard grass instead of the Panicle variety. In ordering the Japanese Panicle variety of millet, it is a good plan to first obtain a sample, which can then be examined to see whether the sample consists of the dark, smooth, shiny seed, and is of good quality and free from weed seeds. The larger quantity could then be ordered according to the sample.

Q.—Is there not sometimes trouble also in obtaining the wrong kind of rape seed?

A.—When ordering rape seed, the variety should always be mentioned. The Dwarf Essex rape is the one which is commonly used throughout Ontario. It is biennial, furnishing leaf and stalk the first year and producing no seed until the second season after it is sown; thus an excellent pasture is furnished in the first season. If rape seed is ordered without mentioning the variety, there is a danger of obtaining the Bird Seed or the German rape, which produces flowers and seeds in the same year in which it is sown. This variety furnishes very poor pasture and is troublesome as a weed. There have been several law suits in Ontario over this very matter. It is certainly advisable to always mention the special name of the distinct variety required when ordering seed.

Q.—Does the summer rape look like common mustard?

A.—The flower resembles that of mustard, but the leaves are quite different and the two plants are easily identified.

Q.—Is the Drumhead cabbage used in the same way as rape?

A.—The Sutton's Earliest Drumhead cabbage, which stands at the head of the list in over thirty varieties of rapes, kales, and cabbages grown at the College, and also in the co-operative experiments throughout Ontario in each of the past two years, is sown and cultivated in exactly the same way as rape, with the object of furnishing a green crop for feeding. Rape is usually fed either by pasturing or by cutting and feeding in the green condition.

Q.—What does the seed of the Drumhead cabbage cost per pound?

A.—It is more expensive than rape, but I am unable to give the exact price without looking the matter up.

PROF. DEAN: I notice that in the average of your sugar beets for 1908, the crop is slightly heavier per acre than mangels. Is that usual?

PROF. ZAVITZ: In most years, the heaviest yielding varieties of mangels will yield rather more than the heaviest yielding varieties of sugar beets. In the average of experiments at the College for the past five years, the highest yielding mangel gave practically 35 tons, and the highest yielding variety of sugar beets for feeding purposes, practically 31 tons of roots per acre.

Q.—Have you had any difficulty in getting pure seed of millet?

A.—We have had some difficulty in buying pure millet seed in Ontario. This seems particularly true in reference to the Hungarian grass. It is more difficult to get pure seed of Hungarian grass than pure seed of the Japanese Panicle variety of millet. It is always wise to first obtain a sample of the millet seed and examine it before ordering a larger quantity.

Q.—What is the idea of using such a small quantity of the complete fertilizer with potatoes? Is that quantity sufficient?

A.—It has been our aim to keep the price of the different fertilizes at about the same amount per acre. When using the complete fertilizer, if we apply as large a quantity of each ingredient as we did when using the ingredients separately, the cost for the complete fertilizer would be about $13.00 per acre, while that for each separate fertilizer would be about $4 or $5 per acre. It would thus be more difficult to compare the results. We expect to do a considerable amount of work in using different quantities of fertilizers with the potato crop here at the College, and the results of these experiments would form a basis for further co-operative experiments with potatoes throughout Ontario.

Prof. Harcourt: The yields of potatoes are somewhat small as compared with what we would find in the Old Countries, and probably the use of larger quantities of fertilizers would furnish higher yields. I found this summer in Scotland that it was a common thing to get from 400 to 500 bushels of marketable potatoes from an acre where they used very large quantities of fertilizers.

Prof. Zavitz: It is not fair to compare yields of potatoes obtained in Ontario with those obtained in Scotland. The moist atmosphere of the British Isles is suitable for the production of plumper grain and larger yields than we can obtain in Ontario, and I think that this would hold true in reference to the production of potatoes. I certainly believe that we would obtain a larger yield per acre by the use of larger amounts of fertilizers, but we must remember that we would at the same time greatly increase the cost. As time goes on we hope to develop our co-operative work with fertilizers throughout Ontario. It takes time to experiment along various lines. We have conducted systematic co-operative experimental work with fertilizers in Ontario for a greater length of time than those of any other part of the world with which I am familiar. The results, although not answering all questions in connection with the application of fertilizers with farm crops, are furnishing us with some very important data. The information so far obtained is not only valuable in itself, but forms a most excellent basis and offers many suggestions for future work.

Q.—Do you sow the fertilizer broadcast?

A.—The fertilizers were all sown broadcast on the land at the time that the potatoes were planted, with the exception of the nitrate of soda, which was sown broadcast on the land when the potato tops were two or three inches in height, after which the surface of all the plots was stirred to a depth of about an inch.

REPORT ON FERTILIZER EXPERIMENTS ON SWAMP SOILS.

By R. Harcourt, Professor of Chemistry, O.A.C., Guelph.

In the spring of 1904 we commenced a study of the composition and peculiarities of Ontario swamp soils. Since that time we have gathered a great deal of information by correspondence, regarding the extent and

productiveness of this type of land. We have also analysed forty-four samples of these soils and conducted both field and pot experiments with fertilizers, and pot experiments in inoculating the swamp soil by means of garden loam and farmyard manure.

In general, it may be said that where the swamp material lies over clay, and particularly if it is not so deep but that some of the clayey materials may become mixed with the top soil, good results are obtained. But when the materials are not sufficiently decomposed to form a soil that will hold water when the land is tile-drained, or when the subsoil is a sand, the results are invariably poor. The last type of soils usually produce fairly satisfactory crops during the first few years, particularly if much brushwood has been burned on the land, but after a comparatively short time the results are far from satisfactory. However, in so far as we are able to judge, these soils are not so common in Ontario as the swamp lands with clayey subsoils.

Out of the forty-four samples analysed, only three were found to contain less than one per cent. of lime, and none of them were noticeably sour or acid. Eight of the samples contained less than 0.3 per cent. of potash and only six had less than 0.2 per cent. of phosphoric acid. In nearly every case the lowest percentage amounts of these plant food constituents were found in swamp soils lying over sandy subsoils. The quantities of potash and phosphoric acid found in these soils are not large; but the average results show fully as much as will be found in most of our good arable soils, and some of them contain an unusually large amount. They also contain from four or five to ten times as much nitrogen as our ordinary soils. Consequently, it is evident that the non-productiveness of these soils cannot always be charged to the lack of plant food.

The results of our determinations of humus show that decomposition has proceeded further in some cases than in others, and, as the nitrogen and possibly the greater part of the mineral constituents are held in organic combination, it is quite probable that in many instances decomposition does not take place rapidly enough to furnish a full supply of food to the plant. Thus it would appear that anything that will hasten the breaking down of the organic matter in the soils should increase the amount of available plant food, and, consequently, the yield of the crop.

As a result of the way in which these soils have been formed, they are frequently deficient in the germs which cause the decomposition of organic matter. To ascertain whether inoculation with soil germs would increase plant growth, we conducted several pot experiments in which inoculation of swamp soil with garden loam was tried. In every experiment the plants in the pots containing the inoculated soil were the most vigorous. We also tried the effect of the addition of a small amount of farmyard manure and obtained a similar result. Both of these added materials contain immense numbers of germs capable of decomposing organic matter, and it is quite possible that the increased growth obtained was due to their aid in bringing the plant food into an available form. As we have not conducted co-operative field experiments on this point, we cannot say definitely how it will work out in actual practice; but many of our correspondents state that the application of light dressings of farmyard manure are essential to the successful cultivation of these soils, especially when the organic matter is deep. This is further confirmed by the results obtained in several of the experiment stations in the United States.

On the other hand, as our analyses show, there are some swamp soils, especially those with sandy subsoils, that are deficient in potash and, to

some extent, in phosphoric acid. We have found it hard to get fertilizer experiments conducted on these particular soils, and have been forced to carry on our experiments on any swamp soil that was not producing satisfactory crops. From year to year we have placed a number of experiments with the idea of ascertaining the effect of fertilizers; but, owing to lack of thorough drainage, and consequent drowning of the crop, the work of wireworms, or other causes, we have obtained comparatively few results. To keep the experiments as simple as possible, we have made most of them three-plot experiments. With corn these plots were one-tenth acre each in size, and with potatoes and oats they were one rod by two rods, or one-eightieth of an acre.

The following are the average results of the complete returns received:

	Fertilizers per acre lbs.	Oat tests bus.
No fertilizers	.....	23.7
Muriate of potash	200	39.0
Muriate of potash and	200	
Thomas phosphate	400	43.1
Experiments with lime included:		
No fertilizers	.....	19.0
Lime	2,400	19.6
Muriate of potash	200	25.8
Muriate of potash and	200	
Thomas phosphate	400	26.7

It will be noticed that potash gave increased yields, especially in the experiment in which lime was not used, while lime and phosphoric acid did not influence it very much. In some instances experimenters reported as to the appearance of the crop, but did not take the trouble to harvest and thresh the grain of the different plots separately.

We have received only one complete report with potatoes, but several experimenters reported decidedly better potatoes on the fertilized plot, but as they did not weigh the crop, we cannot record their results.

One serious drawback to co-operative work on these soils is that experimenters arrange their plots on insufficiently drained ground, consequently, when the season is wet no results are obtained. There have been so many failures due to the drowning out of the crop, that it would appear as though we are warranted in assuming that many of these soils are not drained thoroughly enough to insure a crop in wet, or even moderately wet seasons. Good drainage is naturally the first essential in bringing these swamp lands into cultivation, and it is only after this is accomplished that we can expect to get results, no matter what the after treatment may be.

CO-OPERATIVE EXPERIMENTS IN HORTICULTURE.

By Prof. H. L. Hutt, O.A.C., Guelph.

I. FRUIT GROWING.

The co-operative testing of fruit has been continued this year as usual. Plants were furnished to eight hundred and seventy-six experimenters. These, with the six thousand, six hundred and fifty-five lots which have been sent out in previous years, make altogether seven thousand five hun-

dred and thirty-one lots of plants distributed for co-operative testing. Some to whom they have gone have had failures and some have moved to other places, but the reports received show there are still over five thousand experimenters growing fruits that have been distributed through this co-operative work.

One of the most valuable features of the work has been that it has helped to introduce fruit growing in those sections of the country where fruit is but little grown.

The following is a list of the varieties of the various kinds of fruits which were sent out this year. This list includes only those varieties which by repeated tests here and at the various Ontario Fruit Experiment Stations throughout the Province have proved to be among the most reliable. They have been selected also with a view to making a good collection for home use, giving as much variety as possible, and covering the season from early to late.

1. *Strawberries*: Splendid, Fountain, Ruby and Parsons—12 plants in each.

2. *Raspberries*: Cuthbert, Golden Queen, Marlboro' and Columbian—6 plants of each.

3. *Black Raspberries*: Gregg, Kansas, Palmer and Older—6 plants of each.

4. *Blackberries*: (Adapted only to *Southern sections of Ontario) Agawam, Eldorado, Kittatinny and Snyder—6 plants of each.

5. *Currants*: Fay, Red Cross, Victoria and White Grape—2 plants of each.

6. *Black Currants*: Champion, Lees, Naples and Black Victoria—2 plants of each.

7. *Gooseberries*: Downing, Pearl, Red Jacket and Whitesmith—2 plants of each.

8. *Grapes*: (For *Southern Ontario) Concord, Wilder, Niagara, Lindley, Brighton and Vergennes—1 vine of each.

9. *Grapes*: (For *Northern Ontario), Champion, Worden, Winchell, Delaware, Lindley and Moyer—1 vine of each.

10. *Apples*: (For *Southern Ontario) Primate, Gravenstein, McIntosh, Blenheim, Rhode Island Greening and Northern Spy—1 tree of each.

11. *Apples*: (*For Northern Ontario) Transparent, Duchess, Wealthy, McIntosh, Scott's Winter and Hyslop Crab—1 tree of each.

A concise little bulletin giving cultural directions for the growing and managing of each of these fruits has been sent to each experimenter at the time he received the plants, and blank forms have been furnished each year on which to report the results of the season's crop, or in case of no crop, the vigor of the season's growth. These cultural directions have proved very helpful to beginners and in many cases to experienced growers in calling attention to the methods to be adapted in successful fruit growing on a larger scale.

Experiment with Strawberries.

Over four hundred varieties of strawberries have been tested here during the past fifteen years, and it has been found that no variety retains its supremacy very long; old varieties gradually give way to newer and better ones. And for that reason the list offered to experimenters has been

*This division of the Province into North and South may be approximately made by a line running from Collingwood to Kingston.

changed from time to time to include the newer and better kinds. In looking back over old lists, we find that the following kinds have been distributed for co-operative testing during the past fifteen years: Wilson, Bubach, Williams, Bederwood, Haverland, Woolverton, Van Deman, Clyde, Glen Mary, Saunders, Tennessee, Irene, Splendid, Fountain, Ruby and Parsons.

The varieties sent out for the past two years have been Splendid, Fountain, Ruby and Parsons.

From the reports received, Splendid and Ruby have been the favorite varieties. Both are heavy yielders, of fair sized and good dark coloured fruit. Splendid is a good early and Ruby a good main crop or later variety.

Observations of Experimenters. The observations of experimenters as to what they have learned from the work are often of much general interest, and a few of these may be noted.

One says: "I find you can scarcely get the ground too rich with well rotted manure, and that it is not well to let the runners set too thick."

Another says: "It does not do to plant strawberries on ground lately broken out of sod, as the white grub is almost sure to destroy them."

Another says: "I find no loss of plants when planted from my own stock. Those from a distance are often too dry to live."

Another says: "I find by thinning out plants to five or six inches, I have more and better fruit. I mulch the patch with stable manure, and the result is usually a large crop of fine berries."

Another says: "I have learned that it pays to experiment on a small scale, and plant in quantity those that do the best on my soil."

Another says: "I have learned that it does not pay to work hard all season with strawberries, and leave the garden gate open one night." The statement is explained by a previous one that "The cows got in and ate the plants off just when the fruit had formed."

Experiment With Raspberries.

The varieties sent out for this experiment have been the same from the beginning, viz.: Marlboro', Cuthbert, Columbian and Golden Queen, for nothing has been found that will surpass them in a general collection for home use. The Herbert is a new variety which may take the place of Cuthbert in time, but as yet the plants are very high priced.

About two hundred reports have been received this fall from experimenters to whom these plants have been sent. Some have had excellent results, some only fair, and some have had more or less of a failure. A comparison of the yields of these varieties is not of particular value, for they each fill a distinct place in the supply of fruit for the household. Marlboro is the leading early red, and Cuthbert the main crop red raspberry. Columbian is the best of the purple and Golden Queen the best of the yellow raspberries.

Experiment With Black Raspberries.

The varieties distributed for this experiment the last few years have been Gregg, Kansas, Palmer and Older. Other varieties sent out in earlier years and discarded were Sougegan, Tyler and Hilborn.

Gregg is still the leading variety in southern sections of the Province, where it stands the winter better than in the northern sections. Older is the hardiest of the lot and does well where the others are too tender. Kansas and Palmer do well in some sections, but neither of them bear as large fruit as either Gregg or Older.

Experiment With Blackberries.

Blackberries are less generally grown than any of the other small fruits, no doubt because they are the least hardy; but they fill a gap in the fruit season that no other fruit can, and where they can be successfully grown are one of the most profitable of the small fruits.

The varieties distributed for testing for several years back have been the Agawam, Eldorado, Kittatinny and Snyder. On the whole, Agawam has given the best results throughout the country, because it is one of the hardiest, but in southern sections the Kittatiny is still the favorite.

Experiment With Currants.

Two experiments have been in progress with currants for a number of years, one with red and white varieties and another with the blacks.

The varieties sent out for the former have been Fay, Red Cross, Victoria and White Grape.

The reports received show that Red Cross has been the heaviest yielder of the red varieties, although Fay is preferred by most of the experimenters because of its extra large fruit. White Grape should not be compared with the others, because it is so different. In most cases it out yields all the other kinds, and is especially desirable for home use because of its better quality; but it takes the public a long time to find this out, for it seldom sells for as much as the reds on the market.

Experiment With Black Currants.

Black currants are among the hardiest of the small fruits, and may be grown in northern sections where other fruits fail.

The varieties sent out for the test of black currants have been Champion, Lees, Naples and Black Victoria.

There has not been a marked difference in the yield of these four kinds. On the whole, Champion has given a little the best results, with Naples a close second. With most of the experimenters, however, Black Victoria is a favorite because of its larger size.

Experiment With Gooseberries.

There are two distinct types of gooseberries in cultivation in this country, the English, or European, the plants of which are still imported every year, and the American sorts which have been developed during the last half century from our native species.

The European varieties, as a rule, are not quite so productive as the American varieties, but are much larger in size and finer in appearance. On the other hand, they are subject to mildew in this country, from which the American sorts are usually exempt.

The varieties distributed for co-operative testing, have been Pearl, and Downing, two of the American sorts; Whitesmith, one of the best of the English varieties, and Red Jacket, a hybrid between one of the American and one of the English varieties.

Plants for this test have been sent to six hundred and forty-eight experimenters. The results rank them in the following order for productiveness: Pearl first, with Downing a close second, Red Jacket third, and Whitesmith fourth.

Whitesmith, however, is a favorite wherever it can be grown free from mildew.

Experiment With Grapes.

Grapes are grown commercially only in the southern part of the Province, yet with the proper selection of varieties they may be grown for home use over a much wider area. It was to encourage their more general distribution that we added a grape experiment to our list three years ago. Two different lists of varieties were offered, one adapted more to the southern section, which included Concord, Wilder, Niagara, Brighton, Lindley and Vergennes, and the other included a few of the earliest ripening kinds most likely to mature in the shorter seasons of northern sections. The varieties in this list were Champion, Worden, Winchell, Delaware, Lindley and Moyer. Both of these lists include red, white and black varieties.

As it takes grape vines about three years to begin bearing, no definite results of comparative yields can be given.

Experiment With Apples.

The co-operative test with apple trees has also been in progress for three years. Twelve hundred and nineteen lots of trees have been distributed; but, of course, the reports so far deal only with the success or otherwise of the planting and the rate of growth of the trees. On the whole, these trees have done well, and many experimenters report that all are living and doing well.

In making the selection of varieties, the difference in climatic conditions between the northern and southern parts of the Province had to be considered, consequently two different lists were offered. Those selected for the southern section were, Primate, Gravenstein, McIntosh, Blenheim, Rhode Island Greening, and Northern Spy, all apples of excellent quality and covering the season well from the earliest to the latest. The northern list included Transparent, Duchess, Wealthy, McIntosh, Scott's Winter and Hyslop Crab, all hardy varieties which will be most likely to succeed where the winters are severe.

In concluding this, my fifteenth annual report on the co-operative tests of fruit, I am sorry for some reasons and glad for others that this will be my last report in this capacity. I am pleased that horticulture in this country has reached a stage when specialists are demanded in every branch of the work. For fifteen years I have had charge here of all branches—fruit growing, vegetable gardening, landscape gardening and floriculture. From this time on I shall give my time especially to landscape gardening, with Mr. Hunt to assist in floriculture. Mr. Crow, my worthy assistant, will take charge of the work of fruit growing, with Mr. McMeans to assist in vegetable gardening.

I wish to thank all who have taken part in these experiments for the hearty co-operation they have shown in the work, and for the many encouraging letters I have received from them from time to time. Whether or not the work will be continued in its present form will be a matter for consideration; but I can safely say that all of us engaged in horticultural work here will be pleased to render the public, as well as our students, all the assistance possible, and I feel certain that under the present arrangement better work will be done than ever before.

II. VEGETABLE GROWING.

Seed for co-operative tests with vegetables was sent last spring to two thousand and twenty-three experimenters.

These experiments have been conducted in both town and country gardens in every section of the Province. Because of the educational value of

the work, a special effort was made to introduce it into the schools. Every school in the country which has adopted school gardens conducted a number of the tests, and in many cases where there were no school gardens the children did the work in their home gardens. Our books show that nearly six hundred school children took part in this work.

The crops with which experiments were conducted were beets, carrots, lettuce, onions, and early and late tomatoes. Three of the leading varieties, which have done the best in our College experiments, were sent out for each test. Accompanying each lot of seed was a carefully prepared little bulletin giving directions for conducting the test and blank forms upon which to report the results. On the whole, the season has been a favorable one for this work, and a great many excellent reports have been received.

Experiment With Beets.

The varieties sent out for this test were Detroit Dark Red, Eclipse, and Early Model.

The information asked for regarding beets was not only which grew the biggest and gave the heaviest yield, but which were the earliest and of best quality. For many have learned from these tests that the largest are by no means the best beets.

Reports have been received from nearly a hundred experimenters, the majority of whom place the Detroit Dark Red first when both yield and quality are considered. Eclipse ranked first for earliness, but grows too large and rough for winter use when sowed early in the season. To get good beets for winter use experimenters were advised to sow the seed the latter part of May or first of June. Some experimenters preferred the Early Model because it grows smooth and shapely and not too large for winter use, even when sown early.

Observations by Experimenters. The remarks made by experimenters on their reports are interesting, and often indicate wherein this work has been of most value to that particular experimenter.

One experimenter of ten years' experience says: "This seed must have been better than what we get in the stores, as the beets did extra well."

Another says: "I have learned they must be thinnned early to get good early beets."

Another experimenter of twenty-three years' experience remarks upon the advantage of making two or three thinnings as recommended in our directions, first to two inches apart and then when the beets are about an inch and a half in diameter thinning out again, for in this way there are so many more beets fit for use.

Another experimenter says: "We have learned that the smaller beets are better than the larger ones for table use."

Another experimenter of twenty-five years' experience say he has learned, "That there is a great difference in beets as well as in other vegetables."

Another who has been growing beets for a lifetime says: "The Detroit Dark Red are the nicest I ever grew."

Another says: "I grew eight different varieties of beets this year and Early Model beats them all. I won first prize with it at the Dryden Fall Fair."

Another experimenter says he won first prize in the same variety at the Agricultural Fair held at New Liskeard.

Experiment With Carrots.

The varieties selected for the test with carrots were Chantenay, Danvers Half Long, and Rubicon.

As with the beets, experimenters were expected to take into consideration quality as well as quantity.

Reports have been received from seventy experimenters, the majority of whom concede first place to Chantenay, with Rubicon a close second. The Rubicon is a new variety of good appearance and excellent quality.

Observations by Experimenters. One experimenter of many years' experience says: "It pays to prepare the ground thoroughly and keep the crop well cultivated. After using all we wanted all summer, we harvested one and a quarter bushels of Rubicon and one bushel of each of the others."

Another says: "I find by thinning and cultivating as per your directions, I have much larger carrots than I had last year on the same ground."

Another experimenter says: "I have taken much more interest in growing carrots because now I have learned how to grow them, and will follow your method in the future."

Another experimenter, who "has always grown a few," says: "I never grew such carrots as these before. This was a very dry year and carrots had a poor show, but these were almost too big. I wonder what kind of a crop I would have had if we had had more rain."

Another experimenter of fifteen years' experience says: "By this experiment I have become acquainted with three of the very best varieties, and from this on will grow some of these. For my soil I prefer the Danvers Half Long."

Experiment With Onions.

The varieties sent out for the test with onions were Prizetaker, Yellow Globe, Danvers, and Red Wethersfield.

These have long been known as the three leading varieties of onions, and among the one hundred and fifty experimenters who have reported, opinions are pretty well divided as to which is the best of the three. On the whole, the Prizetaker seems to be a favorite because of its size, but both of the others are better keepers for winter use. Those who object to a red onion prefer the Yellow Danvers.

Observations by Experimenters. From the reports received, it appears that a great many were of the opinion that onions could not be grown as easily from seed as from sets. Several experimenters says that this experiment has proven to them that they can raise a good crop of onions from seed cheaper than from sets

One experimenter says: "These are the first onions I have grown from seed. I have learned a little about growing them, and will not be without them again while I have a good spot to sow seed in."

Another says: "This experiment has taught me most as to spacing and thinning the crop."

Another says: "I have learned that onions form fairly large bulbs even when allowed to grow in clusters."

Another says: "Prizetaker turned out more onions, but I don't think they are as good keepers as the others."

Another experimenter of twenty years' experience says: "I prefer Yellow Globe Danvers for fall and winter, and Prizetaker for summer use."

Experiments with Lettuce.

The varieties sent out for the test with lettuce were Black Seeded Simpson, Denver Market, and Hanson.

These have been three of the best among ninety varieties which have been tested at the College.

From the reports sent in, it appears that the experimenters are about equally divided in their choice between Black Seeded Simpson and Hanson. The seed of the Denver Market for some reason or other did not germinate well, consequently did not give as good results as usual this year.

The most important point observed by experimenters was the advantage of repeatedly thinning out the plants in the rows, first to three inches, then to six, and finally to twelve inches, to obtain full-grown, tender heads.

Experiment with Tomatoes.

Two different lots of seeds were sent out for the tomato tests. One lot of three of the later and better tomatoes, Greater Baltimore, Stone, and Success, which, as a rule, can be successfully grown in the southern sections of the Province, or where there is sufficient summer heat to ripen a full crop; and another lot of three of the earliest varieties, Earliana, June Pink, and Wealthy, which are usually in demand in all parts of the Province, but are particularly valuable for the northern sections where only the earliest kinds can be depended upon to mature a crop. The greatest popularity of the early varieties over the later ones by the general growers of the country may be inferred from the fact that while we had one hundred and fifty-one applications for the later ones, there were four hundred and fifty-five for the early varieties.

As it has turned out, however, the past season has been a record-breaker for the ripening of tomatoes. We had about one hundred varieties in our trial plots here, and had the finest crop of tomatoes ever grown on the place; even the late kinds, which some seasons will not ripen at all, matured a full crop.

The reports of the experimenters show that Success has been the favorite with those who conducted the test of late varieties. Greater Baltimore ranked second and Stone third.

Among the experimenters with the early varieties, there is a much greater diversity of opinion as to which is best, for all have done so well. A summary of the results shows, however, that Earliana is still the favorite, with Wealthy a close second, and June Pink third.

Observations of Experimenters.—A Grey County experimenter of twenty years' experience says: "We never got as good seed nor had as strong plants before."

Another experimenter of ten years' experience says: "The most important result observed is that we had ripe tomatoes this year instead of green ones. Thank you very kindly for the seeds."

A Muskoka experimenter of eighteen years' experience, with whom June Pink did the best, says: "We never had any do as well as these."'

A Welland County experimenter says: "Spreading out the vines as directed in your instructions certainly makes a material difference in the earlier ripening of the fruit."

An Essex County experimenter who grows tomatoes on a large scale for market says: "June Pink is not profitable enough for the market because of its color. Wealthy is certainly a good cropper, but Earliana still leads with us."

A Perth experimenter sizes the varieties up well from the consumer's standpoint. He says: "June Pink is the best for slicing, being solid and meaty. Wealthy would likely lead in the market, being smooth and well ripened about the stem. Earliana is the earliest, but usually remains green around the stem, and is not nearly so solid in texture."

REPORT ON CO-OPERATIVE FORESTRY.

By E. J. Zavitz, O. A. C., Guelph.

This last season the Forestry Department has sent out to farmers for making plantations about 400,000 plants, This material was chiefly composed of White Pine, Scotch Pine, Jack Pine and Black Locust; these trees being best adapted to waste land planting.

In addition to material sent out for waste land planting the Department has supplied Public Schools with collections of small forest trees to be used in the school gardens or places otherwise provided on the school grounds. The collections this year were composed of the following species:—White Pine, Scotch Pine, Norway Spruce, Arbor Vitae, White Ash, Black Walnut, Butternut and Whitewood. This material is not large enough for final planting about the grounds, but is placed in nursery lines in a plot on the school grounds. It is expected that the children will be interested and educated in the care of these trees and later may take them home or plant them about the school grounds.

At a meeting of this Union held in 1903 there was a resolution adopted, two clauses of which I would like to discuss. The Union at this time urged upon the Government the necessity:

"For collecting accurate information from the municipal authorities as to the amount of lands unfit for agriculture in the settled townships of Ontario."

"For undertaking the practical reforestation of areas sufficiently large to afford forest conditions."

At the last session of the Legislature we find a vote for waste land reclamation, which marks the beginning of a policy to fulfil the needs outlined in the above clauses.

During the last two years a study has been made of conditions in the older townships. A report dealing with this will be published by the Government and I will only briefly describe the work.

We have in Ontario two classes of lands which it is advisable to manage for forest crops.

First, the small isolated patches of non-agricultural soils to be found throughout otherwise good farm lands. These are sand, gravel or rock formation, steep hill sides, etc. The reclamation of these worthless soils must depend upon local initiative, although Government assistance of an educational nature is advisable. The Department of Agriculture's co-operative distribution of planting material aims to do this.

Second are those large, contiguous areas of non-agricultural soils which can only be reclaimed through state management. We have in old, agricultural Ontario some few hundred square miles of these lands, some of which have been roughly surveyed, and are as follows:—South Norfolk, 10,000 acres; Lambton, 40,000 acres; Simcoe, 60,000 acres; Durham, 6,000 acres; Northumberland, 8,000 acres.

The above lands are all pure sand formation and have all had much the same history.

The lumberman in early days took out the good timber. Some sections have been cleared for farming purposes and since abandoned. In many cases the land is still being farmed, or rather attempts are being made to farm it. This presents one of the worst features of the waste land problem.

Through the vote given by the last Legislature, reclamation work has been commenced in Norfolk County, so that I will describe conditions there more in detail.

The first land was purchased in South Walsingham, where a block of about 3,000 acres exists. The land purchased lies at the border of the area and is an abandoned farm. It left the Crown in 1804 and comes back to it in 1908, a period of over 100 years. It has all been cleared with the exception of about fifteen acres. This fifteen acres is representative of the entire area. It is covered with Scrub Oak and scattered scrubby White Pine. If protected from fire this would soon fill with White Pine. I might say right here that a large proportion of these lands in Norfolk County and other counties do not present so much a problem of reforestation or replanting as of protection from ground fires through proper management. The scattered old scrub or defective Pine which the lumberman left are always endeavoring to reproduce, but periodically ground fires sweep through and kill the young Pines.

This first land purchased has enough soil suitable for nursery work, so that the Government nurseries have been moved to this district. They can be managed here at less cost and can supply material for the co-operative work as well as for local needs.

This farm is one of many which are gradually being abandoned, and I give you the following to show the reason. There are two supposed sources of revenue on these farms—growing rye and buckwheat. I will illustrate with the rye crop, which is probably the better investment:

Fall Rye produces on this land an average of 10 bus. to the acre which at 75c. would be $7.50

Cost of preparing one acre of land (team and man figured at $2.50 per day).

Plowing	(man and team plows 2 acres per day)	$1.25	
Harrow and Roll	" " " H & R about 10 acres per day	.20	
Seeding	" " " seeds " 10 " " "	.20	
Seed	(1½ bus. per acre @ 75c.)	1.12	
Cutting	....	.75	
Threshing	(2c per bus.—10 bus.)	.20	3.72
		Balance	3.78

This shows an annual revenue of $3.78 per acre, but does not take into consideration taxes, etc., which should be charged against the crop.

The policy of putting such lands under forest management has many arguments in its favor. It will assist in insuring a wood supply for the future; protect the headwaters of streams and insure breeding grounds for wild game. These areas being properly managed for forestry purposes will be splendid object lessons to visitors from surrounding communities.

Besides this economic aspect there is one of a moral character which appeals even more strongly as one studies the local conditions.

The story of the abandoned farm with its struggles if written would not be a mere fanciful sketch. As one writer has said, "It is a story of grim tragedy, written in varying forms as to detail in blood, and sweat, and tears, in Clarke, in Thorah, in Innisfil, and in a hundred townships of what we now call older Ontario."

H. R. McMillan: There are two very great economic reasons for carrying on this work. Probably the greatest and one which we are not very prone to realize yet, is the securing of timber. The people of southern Ontario very commonly believe that southern Ontario is all agricultural land, and very valuable, and that they cannot afford to raise timber on it, and that when the timber disappears from this country they will go further north and get it. I have just come back from a trip to the timber country of northern Manitoba, Saskatchewan, Alberta, and the east slope of the Rocky Mountains, and I do not feel the slightest hesitation in saying we have not got 10 per cent. of the timber in this country that we think we have. Further, when it comes to a matter of bringing that lumber down here, then the price will be double or quadruple what it is now, and another point we are overlooking is that the quality of the timber produced in southern Ontario originally was the most valuable of any east of the Rocky Mountains. The second reason why we should go ahead with this work is that it is the duty of the Government to make some use of these lands, and get the value of all our natural resources on our soil and with our stock and in the matter of seed and everything else. We are trying to do the best we can with what we have, and I think it is absolutely necessary for the State to undertake some steps to reclaim those waste lands

Mr. Zavitz has shown quite convincingly that there is no possibility of raising any agricultural crop on these lands. There are areas in this country that are no good for anything else all the way from Peterboro to Ottawa. In the rock region you can travel for half a day on the railroad and not see one prosperous farmer. The reason that no private party can be trusted to do this work is that the life of the individual and his ambitions are measured by the length of his days. He will not go ahead with a business proposition unless he thinks he can get returns from it before he dies, and we all know that we cannot get financial returns in the way of lumber from any of these plantations in any case in less than 60 or 75 years, and in a great many cases in not less than 100 years. Any person who has investigated the subject can see that at the end of 100 years or 110 years, figuring the cost of land and planting and everything else there is a good return, probably over 3 per cent. and sometimes as high as 10 per cent.

Another reason why it should be developed by State control is that the whole work should be done under one adminstration, so that there shall be expert technical knowledge available for the selection of areas, of the land to buy in order to get the best benefit from the money invested; how to plant and where to plant in order that organization may be developed to protect the growing timber from fire.

These are all reasons which may be given to show it is a State function to reclaim these waste lands. Any person who looks into the matter in Southern Ontario to-day, where manufacturing industries are increasing, and where hardwood timber is becoming more and more scarce, must see that it is a serious question. We have no hardwood in Canada outside of Ontario and Southern Quebec and a little in Nova Scotia and New Brunswick; in fact, our furniture is now being brought from Michigan, and our timber for implements is being brought from Ohio. It is not going to be very long before we will have no hardwood, and therefore I say it is absolutely necessary for the development of our manufacturing industries that something should be done.

The farmers need these wood lands for the protection of the water supply. I do not think it requires any further arguments whatever to prove it is a State function to go ahead with the reclaiming of these forest lands.

Mr. McCready: I would like to emphasize one of the points that was raised by Mr. Zavitz. He said that one of the things that his department was trying to do is to educate the people of the country through the public schools, in the matter of growing trees, by sending out to country and village schools in the Province trees to be planted on the school grounds or in the gardens or on some of the land adjacent to the school. I have come in contact with a number of teachers who have undertaken this work, and who speak very highly of the good that is being accomplished through it.

Mr. W. L. Smith: While we all appreciate the work Mr. C. A. Zavitz is carrying on, still, after all, this means adding to the prosperity of the people who are already prosperous. Yet the work of Mr. E. J. Zavitz is carrying one means more to the Province of Ontario than that; it means the actual saving of the lives of the people. I do not mean saving them from death, but from waste. I do not think I ever heard a more practical story than that Mr. Zavitz told us of a farm that had been farmed for 100 years and had given no practical returns. It means three generations of wasted lives in that part of the Province, and that is in one section alone between Peterborough and Ottawa. It is a positive crime to allow people to bring up families as they are bringing them up there at the present time. I think there is no more important work the Agricultural Department can carry on than the re-claiming of these waste lands. I believe our grand-children will reap greater benefits from it than anything else.

LEGISLATIVE CONTROL OF FEEDING STUFFS.

By Prof. W. P. Gamble, O.A.C., Guelph.

The subject of "Legislative Control of Feeds" has received considerable attention from the association in years that are gone by, and some important pioneer work has been done. For the benefit of those who are not conversant with the status of this work, I would like to state, first, the reasons why this association thought some action should be taken in the matter, and, secondly, state in brief what steps have been taken by the association.

The purchase of feeds, either to supplement home grown produce, or to provide the entire amount of concentrates needed, requires that care should be exercised in order to obtain the most economical results. It is now fully recognized that feeds rich in protein should be added to the home grown products if they are to be utilized to the best advantage, since, under average conditions, the crops of both grain and straw contain so great an excess of the carbohydrates, or starchy substance, as to make their exclusive use wasteful. The feeds that are best adapted to this end, namely, those rich in protein, as a rule, consist of residues from the manufacture of some specific product from the seed or grain, as, for example, oil from cotton seed and flax seed, starch or sugar from corn, beer from barley, and flour from wheat, rye and buckwheat. All of the feed stuffs which include cotton-seed meal, linseed meal, dried brewer's grains, gluten meal, gluten feeds, and the various kinds of bran, middlings, etc., are very much richer in protein than the original seeds or grains, because the substance extracted from them consists of fat, in the case of the first two, and of starch or products rich in starch in the case of the others, thus proportionately increasing the protein in the residues. For this reason, all of these by-products have been found to serve an excellent purpose in the building up of rations; they are generally palatable and healthful,

and if judiciuosly used, do not contribute any undesirable qualities to the products, beef or milk; besides, they possess the further advantage in that, in many cases, the cost of the ration is reduced by their use. Their intelligent purchase and economical use, however, require that the purchaser shall possess a definite knowledge of their composition; that is, he should know, first, not only how much protein and fat the genuine products of cotton-seed meal linseed meal, gluten meal, gluten feed, bran, and middlings contain, but also whether there is reasonable uniformity or wide variation in respect to these compounds in the composition of the products of the same kind or name; secondly, whether any of them are liable to be reduced in value by the addition of cheaper substances.

In order to furnish definite information concerning the character and composition of the feeds offered for sale, this College collected a large number of samples and analysed them, the results of which were published in Bulletin No. 138. The samples secured included most of the commercial feeds of the Province of the various classes, and the analyses, besides indicating average composition, showed that many of the various products sold were of good quality, and that those of the same kind from different manufacturers varied in their composition within quite wide limits. In 1905 a special study was made of the gluten products, or residues from the starch and glucose factories, as, owing to the large number of products sold under the general name of gluten meal or feed, it seemed desirable that we should have detailed information concerning their character, composition and usefulness. Let me at this point bear testimony to the fact that Mr. Shutt, chemist of the Dominion Experimental Farms, Ottawa, has drawn the attention of the Standing Committee of the House of Commons to this most important matter. It, therefore, seemed to us desirable that such definite information as we were able to obtain, both from our own work and that published by Mr. Shutt, should be pointed out; and that steps should be taken to have concentrated feeds classified according to their composition, rather than according to their brand name.

These special studies, coupled with the inspections ordered by the Department of Inland Revenue, Ottawa, led us to petition the Dominion for an Act to regulate the sale of concentrated feeds. A copy of the last petition may be found in the twenty-eighth report of the Ontario Agricultural and Experimental Union, page 74. Two years have passed since this petition was presented, but as yet we have been unable to obtain any definite reply with reference to it. I would, therefore, move that Professors R. Harcourt, C. A. Zavitz, and G. E. Day be appointed a committee for 1909, not only to communicate by letter with the Government, but to interview the proper persons with the view of obtaining an enactment of the law along the lines laid down in the recommendations of the Experimental Union. The motion was duly seconded.

Mr. Fraser: I think that is perhaps the most important thing that has been brought before the meeting. The farmers all over the country are continually buying feeds and they do not know what they are getting. The Grain Commission held a meeting in Toronto some years ago, and samples of bran were brought there containing weed seeds that were alarming, and the results of feeding this stuff is very disappointing to stock feeders.

Prof. Gamble: During the past summer we have analyzed several samples of bran which we found to be heavily adulterated with oat hulls and other useless refuse, and this analysis simply confirmed our impression that it is absolutely necessary that something should be done.

The motion was carried unanimously.

THE VALUE AND THE SCOPE OF CO-OPERATIVE ASSOCIATIONS IN ONTARIO.

By W. L. Smith, Editor "Weekly Sun," Toronto.

I have been asked to speak of the value and scope of Co-operative Associations in Ontario.

If all those who are present had seen the exhibit which the Norfolk Co-operative Fruit-Growers' Association made at the recent Fruit, Flower and Honey Show in Toronto, and knew the history behind that exhibit, it would not be necessary to say one word as to the value of co-operation as applied to at least one line of Agricultural activity. Co-operation has, in the case of Norfolk, been the means of placing one of the poorest apple growing counties in the Province in the front rank of apple production. It has been the means of introducing the best methods of cultivation and care where, before, there was practically no method at all. It has been the means of producing the very best quality where little but inferior was previously grown; and it has transformed orchards that were dead assets into most profitable properties. All this has been accomplished by the formation of a Co-operative Organization that has carried with it co-operative spraying, co-operative packing, and co-operative selling.

What co-operation has done in the case of Norfolk fruit growers it has also done, but in a larger way, for the Niagara producers of tender fruits. Fruit growing in the Niagara district was, a few years ago, a languishing industry. There was lack of sufficient outlet even for the volume of production of that day. Now, with double the production of ten years since there is abounding prosperity. This is the result of the introduction of a system, which by making possible shipments in car lots, has reduced freight charges; by the co-operative use of telephone and telegraph has made it feasible to so distribute shipments that there is neither glut nor famine in any section, and has even enabled Niagara growers to largely command such distant markets as those of Halifax on the one side, and Winnipeg and beyond, on the other,

What has been done in these two cases has been done, in a comparatively small way, in scores of other cases in which the principle of co-operation has been applied. Of these, however, I shall leave Mr. Lick, who is manager of one of the best Co-operative Apple Shipping Associations in the Province, to speak more in detail.

I shall now proceed to say something in regard to what I conceive to be the possible scope of co-operative associations in Ontario. I do not see any reason why these associations should be confined to the promotion of fruit growing and fruit selling. There is no sufficient reason, in my opinion, why the same principle could not be applied along a score of lines. Let us take a few lines by way of illustration.

In Southwestern Ontario corn is largely grown for sale; in Central and Eastern Ontario, corn is largely bought for feed. Why should there not be co-operative selling organizations in Kent and Essex through which sales could be made in car lots to co-operative buying organizations in the counties of Ontario and Wellington. Why, indeed, should those who are associated with Mr. Lick in co-operative apple growing and who are also largely engaged in the winter feeding of cattle, not buy their feed in this way? There is no reason, either, why such transactions should be limited to corn. In the Western Provinces there are large quantities of coarse and inferior grain to be disposed of every year. At present the only profit in handling this feed goes to the middleman and carrier. Why should not the grain growers of the

West, who have their own organizations now, sell directly to co-operative associations of feeders in this Province, and thus leave to be divided between producer and consumer a profit that at present goes to the middleman who stands between them.

In Kent, bean growing may almost be considered the chief industry of the country. What is there to prevent the formation of a co-operative association of Kent bean growers, with their own storehouses, from which car lot sales could be made according to the demand of the consuming market.

Onion growing is another industry which naturally lends itself to specialization, and one that is confined to a few localities. There can be no doubt that larger profits in this line could be realized by the building of co-operatve sales in car lots.

Poultry growing is fairly profitable now, but the profit might be largely increased if a number of neighboring farmers would keep the same breeds, in comparatively large numbers and provide for uniform grading of eggs, and the uniform dressing of chicks. Such an organization, which could promise certain delivery of large quantities of poultry and eggs of absolutely assured quality, might easily realize from 10 to 20 per cent, better prices than are obtained under the present haphazard system.

There is one thought which has often crossed my mind, that I would like to lay before this audience. Is it not possible to secure the organization of co-operative associations of consumers in cities to which sales could be made direct by co-operative producers' associations in the surrounding country? There is, if we take the case of two European countries together, a precedent for organization along this line. Denmark is almost exclusively an agricultural country with a large surplus of food stuffs for sale annually. Great Britain is almost exclusively a manufacturing and trading country and is under the necessity of importing a large volume of bread stuffs for home consumption. In Denmark the production and handling of the surplus of food stuffs is largely carried on through co-operative associations. In the United Kingdom a large proportion of the consuming public apply co-operative methods to buying and distributing. In Denmark, according to Fay's "Co-operation at Home and Abroad," one-fourth of the export trade in eggs is handled from point of production to the point of shipment through co-operative associations. Sixty-six per cent. of the bacon output is handled through co-operative factories, and 80 per cent. of the dairy products exported are produced and exported through co-operative federations.

In the United Kingdom, according to the same authority, 20 per cent. of the population, one-fifth of the whole, buy their supplies through great co-operative stores. The sales of these stores in 1906 reached the enormous total of $300,000,000, with profits of close on $10,000,000. The sales of these stores are made at regular market prices and profits are distributed as a bonus to the purchasers according to the volume of the individual purchase made, Thus at the end of three months or a year, these co-operators receive a lump sum which is really so much found money to them and that in the absence of co-operation would have gone to the needless middleman.

Now the idea in my mind is that an effort should be made to organize co-operative associations of consumers in Toronto and other cities which would buy direct from co-operative fruit growers, dairymen, poultry men, vegetable growers, etc., through the country. At present there are many lines in which the Toronto householder pays $1 for an article that returns to the producer 50 cents. I believe two-thirds of this loss should be divided between producer and consumer by the adoption of the method suggested.

The last point I wish to present for your consideration is this: The Department of Agriculture has done much, by its educational campaign, to increase production; should it not now direct its efforts largely towards improving the returns at the market end, by advice, direction and suggestion calculated to help on this great co-operative movement that means so much for Ontario agriculture?

I did not think we had gone so far as to have 90 leading varieties of potatoes in this province. If you go to the Commission houses in Ontario they will tell you it is an impossibility to obtain from any portion of this Province a car load of potatoes of any single variety, and as a result of that the dealers are going to the Maritime Provinces, where they can obtain not only car loads but train loads of one single variety. If the farmers would combine in one section to grow the same kind of potatoes and ship them in car load lots, there is no doubt they would obtain better prices. (Applause.)

Elmer Lick: I have been very much pleased indeed at the remarks Mr. Smith has made in connection with Co-operation. When coming up on the train, I was thinking of what was the foundation of the success of Ontario in the cheese industry. Was not it the beginning of co-operation? The farmers worked together at the factory. Has it not been continued largely on this co-operation plan?

Then my thoughts ran a little farther back, and I wondered why, in this day, we have forgotten the spirit of co-operation that existed among the first settlers in this country when they worked together and helped one another and put up their first barns and first houses, and many times helped one another in making the first clearing, and I thought we could achieve wonderful results by co-operation.

Mr. Smith spoke particularly of the apple industry, and what is true of co-operation in the apple industry would be true of everything else. Co-operation stands for these two things particularly, more and better quality, and marketed more economically, and the producer will have the best results for his labour.

Mr. Smith has outlined quite a number of things where co-operation should be possible. One thing he mentioned was the poultry industry, and right in our own section of the country that could be developed to almost as great an extent, and with as good results as has been obtained with apples. We are doing very well with apples; we handled 11,000 barrels last year under very discouraging conditions; we followed the same course this year, and it has been a pleasure to handle the apples—the dealers are tumbling over one another to get them. You can hardly leave the house for fear you will get a telegram or telephone message stating, "We want apples."

The whole thing resolves itself to this, that we must largely do away with our individuality. We must furnish the best produce we can, and then turn it into a co-operative association and be content with the directors and the management who handle it, for the very best results, and occasionally if it does not come out as we anticipated we must put up with the consequences, because in the long run we will be much better off. It is a question in regard to which we are only at the beginning, and there is no doubt we are going to make more or less mistakes. Let us learn to trust one another, and go on steadily until we shall make the Province of Ontario a better country to live in.

J. O. Laird: I am sure you have all listened with a great deal of interest and pleasure to the address by Mr. Smith and the discussion by Mr. Lick. Mr. Smith spoke of the corn we grow in Essex. There is a lot of corn grown there, and co-operation would certainly be a great benefit.

We have formed a company in the southern part of Kent, which is known as the bean section. We have a joint stock company that was incorporated in 1903 with a capital of $135,000 and about $14,000 paid in. The company owns a good plant for handling beans and other kinds of grains and has been doing business for five years. From August 1907 to August 1908 they handled 60,000 bushels of beans, 135,700 bushels of barley, 139,000 bushels of oats, and about 70,000 bushels of wheat, which makes altogether about 400,000 bushels of grain handled by that company during the year, and this number is about the average for the five years. It is managed by a board of directors. The reason the company was started was due to the combine among bean buyers in the city of Chatham. These buyers made a profit of at least 25c. on each bushel, and as much more as they could. As a result of the formation of our company, where we used to get 8 cents or 10 cents per bushel lower than we would get in Chatham or London, we are now able to get 10 cents per bushel more, and still make a profit sufficient to run the business and even a little more. I think we are safe in saying that each year we make 5 cents on every bushel. It amounts to about $24,000 annually and the company has been in existence five years. That means we have received $120,000 more than we would have received had this company not been formed, and the outlay so far has been between $14,000 and $15,000. $25,000 more in one community in a year is a great deal, and no doubt that scheme could be worked out throughout the Province in other lines.

This company handles salt, binder twine, and such things, and in that way sometimes saves the farmers considerable.

Q.—Do you buy grain from the farmers?

A.—We buy grain from anybody, whether they belong to the company or not. The Canada Milling Company also does business in the same town, and they have bought as much grain in the same season as we have, and they have been forced to pay the same price; and if you look at it in that way the amount has not been $124,000, but twice that.

Prof. Dean: I have taken an active interest in this matter of co-operation. Co-operation has been applied to the dairy industry in the Province of Ontario to a greater extent than any other branch of agriculture, and what it has done for the dairy industry, it will do for other lines of farming. I was very much pleased to hear Mr. Smith give his address and also to hear such kindly words of counsel from Mr. Lick.

I do not think we have had too much co-operation in the production of farm crops, but we have certainly been lacking in co-operation in selling farm products. We are weak in that direction. In Great Britain the railways publish a list of the farmers along their lines who have produce to sell; the list is published free and distributed to the people in London and the towns throughout which the railways run, and these people buy from the farmers directly. They carry ordinary farm produce parcels for 8 cents. We ship to a large number of customers in Toronto 24 lbs. butter, and they charge us 35 cents express for a distance of less than 50 miles, and that is more than double the price charged on the British railways. There is something radically wrong with our methods of selling in this country, and until the farmers co-operate and work together it will continue. I think what we need is a revivalist to arouse the farmers on this question of the value of co-operation in selling farm produce.

I will say to Mr. Smith to keep right at it, and not get discouraged, and he will meet with success in time.

W. L. Smith: What Professor Dean has said with regard to express rates brings up a most important matter. The Railway Commission has power to compel the express companies to bring these rates down to a reasonable figure, and pressure should be brought to bear upon the present Government to compel them to give a parcel post rate in this country the same as in Great Britain, where you can send a parcel 3 feet square, and you can send your poultry or butter or fruit through the post office, and I would like to see a resolution passed here urging upon the Government that they give a parcel post rate the same as in Great Britain.

A Member: How did the Grange pronounce on that matter?

W. L. Smith: They pronounced favorably on it a year ago, but the greater the number of the organizations which pronounce on it, the quicker the Government will deal with the matter.

PRIZE COMPETITIONS IN STANDING FIELDS OF SEED GRAIN.

By J. Lockie Wilson, Superintendent of Agricultural Societies, Toronto.

When you consider that the field crops of the Province of Ontario amount to $140,000,000 annually, you can have some idea of the grand work that you are doing in improving the field crops of the Province of Ontario.

Last year twelve Agricultural Societies entered the grain competition and about 1,200 acres of land were utilized. This year we have 650 entries and nearly fifty Agricultural Societies, and in all 6,000 acres were utilized for this work of field crop competition. We confined our work this year to the oat crop. When you consider that 100,000,000 bushels of oats were grown last year in the Province of Ontario, you will realize that the oat crop of the Province is one of our most important ones. We have on exhibit at the Fat Stock Show to-day between 80 and 100 sacks of prize-winning grain taken from these fields. West of Toronto prize-winning lots are exhibited at Guelph, and those east of Toronto will be exhibited at Ottawa. Altogether we will have in the neighborhood of 150 bushels exhibited at the fair here, and nearly the same quantity at the Winter Fair at Ottawa, in January. The judging was done by judges selected by the seed department at Ottawa. In the Field Crop Competition, the stand of the crop, the apparent yield of the straw and the grain and the amount and the kinds of weeds and other impurities which grew up in the crop, were all considered.

We want to get as many of the farmers in the Province to take up this work during the coming year as possible. The judges delivered short addresses to the farmers in the vicinity where the field crops were grown, and gave reasons for their judgment.

I feel that it would be trespassing on your time to go further into this question. I know that it receives your hearty co-operation, and that the work has met with approval of the farmers of Ontario.

I was out in the western country a year ago and on my way home I looked through a number of cars that were coming to the Province of Ontario and were then at Fort William. I selected a number of small sacks from each car load and from 20 to 25 per cent. of them contained wild oats, mustard and other noxious weeds. If it is important to keep the cattle of the United States from coming into this country for fear of infection from

foot and mouth disease, is it not just as as important to prevent farmers in this country from being ruined by noxious weeds that are being sent here by the car load from other places. (Applause).

The men who produce grain in this country are important to the welfare of this great Province of Ontario, and I am in accord with what you have done in passing that resolution, and I hope urgent and stringent measures will be taken to prevent these noxious weeds from getting greater hold upon our fields.

We have issued a report from the Department of Agriculture, and if any of you would like to get it we will be glad to send it. It gives the names of the different kinds of noxious weeds that were found in the field crops that were judged in the recent Field Competition. Last year our grain crops fell down in yields in some instances. The winter wheat crop covered 679,000 acres in 1908, and gave a yield of 16,430,000 bushels or 24 bushels to the acre; in 1907 with this crop we had 676,164 acres with a yield of 23 bushels per acre. Spring wheat with a total of 2,197,000 bushels gave 15 bushels to the acre in 1908; the spring wheat crop of 1907 averaged 17 bushels to the acre. These figures indicate that we have been dropping back to some extent.

I am pleased to have had the opportunity of being with you to-day, and I hope you will feel that we are working hand in hand, and that we are all looking after the best interests of the farmers of Ontario. When you consider that we have 6,000,000 acres of grain in this Province, you will appreciate the great value of the work that we have in hand. I thank you for your kindly and courteous hearing and I hope at some other time I may have an opportunity of listening to the discussions that are of such vital importance to all who hear them.

I am glad to know that the students of our Agricultural College coming from the farm homes of this great country are doing themselves credit, and if they continue to do as they have done in the past they will climb higher the ladder of fame and make this College and this province a place to be greatly desired.

> " At least not rotting like the weed ;
> But having sown some generous seed,
> Fruitful of further thought and deed."

THE ERADICATION OF THE PERENNIAL SOW THISTLE AND OTHER TROUBLESOME WEEDS.

By J. E. Howitt, Demonstrator in Botany, O.A.C., Guelph.

It does not seem right that I should discuss this subject when there are so many present who have had more practical experience than I have had.

The Botanical department, however, wishes to learn as much as possible about the weed pests of the Province of Ontario, and we open the discussion in order that we may hear the experiences of those who have had to fight these pests. There are many points that we may be able to clear up by free and open discussion. Nearly every man has his own idea about eradication of weeds; one man will tell you his method is best, and another will give you another method as the best. "The proof of the pudding is in the eating," and the value of a method is in its cheapness and effectiveness, and only those who have tried a method can vouch for this. It is from those, then, who have tried different methods that we wish to hear to-day, and we hope you will all take part in the discussion.

I will start with the Perennial Sow Thistle, because I think it is the worst weed we have in the Province to-day, judging from the number of enquiries we have received about it. I do not need to dwell upon it; I think you are all well aware of what a bad weed it is, but I will proceed at once to state how I think we can best control it. I think it can be controlled by education, by proper methods of extermination, by co-operation, and if necessary by legislation.

By education, I mean that all persons engaged in agriculture should make themselves so familiar with it; with its habits of growth, its methods of production, and the way its seeds are dispersed, and that they should be able to tell it from the other two sow thistles which are comparatively harmless.

Every week we receive specimens of the annual Sow Thistle sent in to us, and we are asked whether they are the Perennial Sow Thistle. I would therefore like to impress upon you the importance of knowing the Perennial Sow Thistle when you see it.

In the first place it will appear in a few scattered patches in the field. At this time it is not hard to get rid of. It is after it has been in a field a year or two and become established that it is such a serious pest. We have only one Perennial Sow Thistle.

The Perennial Sow Thistle is a tall, coarse growing perennial weed, with deep roots and numerous, thick, underground stems or rootstocks, commonly spoken of as "roots." Upon these at intervals of a few inches are borne buds which develop into new plants. The stem is smooth and hollow and the whole plant is filled with a bitter, milky juice. The leaves are pointed, 4 to 12 inches long, deeply cut with segments pointed backwards (runcinate), slightly prickly. The flowers, or more correctly speaking, the heads of the flowers, are about 1 to 1½ inches across and bright orange in color. The involucre, or as it is commonly called, the flower cup, and the peduncles or flower stems are covered with distinct yellow glandular bristles. The seeds are dark reddish-brown in color, about 1/8 of an inch long, somewhat spindle shaped with blunt ends, and each surface bears a number of very deep wrinkled longitudinal ribs. Each seed bears at the top a tuft of white silky hairs (pappus), which, when dry, acts as a parachute and enables the seed to be borne long distances by the wind.

I have just touched on these points to distinguish this weed, because I think it is important that everybody engaged in agriculture should know the Sow Thistle on sight.

Now, passing to the methods of eradication. These methods are put forward as suggestions; most of them have been tried with more or less success. I leave them with you to criticise and give us your experience. The first I shall touch upon is one that has been suggested by Prof. Zavitz, who found it successful in dealing with the Couch Grass.

Method No. 1. Cultivate the field until about the middle of June, running over it frequently with the cultivator, so as to keep the tops down and thus weaken the "roots." Then apply manure at the rate of about 20 tons per acre (12 good loads). Cultivate the manure in thoroughly, and with a double mould board plow slightly ridge up the land, making the ridges about 26 inches apart. On the ridges sow pasture rape at the rate of 1½ pounds per acre. It is important that the right amount of rape should be sown, for if too little is sown the stand will not be thick enough to smother the weeds, and if on the other hand too much is sown the plants will be too crowded and not grow vigorously enough to keep ahead of the thistle. Sow the rape when the land is sufficiently moist to insure quick germination of the seed.

If the rape is slow in starting the Sow Thistle may get a start in the rows and thus necessitate hand cultivation there. Cultivate the rape every week or ten days until it occupies all the ground and makes further cultivation impossible. If, when the rape is cut or pastured, any Sow Thistles remain, the field should be ridged up the last thing in the fall and put in with a hoed crop the following year. This should not be necessary if a good stand of rape is secured.

Method No. 2. This is a system of intensive cropping, suggested by Prof. Zavitz. As soon as a cereal crop is harvested, plow the land and give frequent cultivation to the first or middle of September. Then sow winter rye at the rate of about two bushels per acre. This can be pastured the following spring, or cut for grain or hay. As soon as the crop is off the land, put in rape, turnips or buckwheat. The advantage of this system is that three crops are harvested in two years and the Sow Thistle fought at the same time.

Method No. 3. This is a short rotation which has been recommended by several Farmers' Institute workers. Clover is followed by a crop of grain, then clover again. The clover is cut in June, and the land plowed about four inches deep and given frequent and thorough cultivation during the rest of the summer. The following spring a grain crop is sown, seeding down with clover. For best results the grain crop should be one which can be cut early enough to prevent the thistle from seeding.

Method No. 4. Directly after harvest plow the land lightly, and then give frequent cultivation as long as the season permits. The following spring gang-plow, and leave in summer fallow until it is time to sow fall wheat. The summer fallow to be effective should be a *bare fallow*. The field must be cultivated thoroughly and frequently, with the object of keeping the tops down and breaking up and bringing to the surface of the ground as many of the "roots" as possible. The gang-plow should occasionally be run over the field in order to insure the cutting of the roots. Bare summer fallow has given excellent results on the College farm in seasons when other methods were at best only partially effective.

Co-operation is essential in dealing with the Perennial Thistle. I believe all the farmers in the district must unite if this pest is going to be controlled, because a patch of Sow Thistle in one farmer's field may be a source of contamination for the whole neighborhood.

I think legislation may be necessary in dealing with this pest. It seems to me a time is coming when we will not tolerate the man who allows any bad weed to go to seed on his farm, and to become a source of contamination to his neighbor who spends a great deal of time and money to eradicate all the weeds from his farm, only to receive a fresh stock of seed year after year from his careless neighbor. I do not see why a man like that should be tolerated any more that a man who keeps a vicious dog.

These are points that I leave to your consideration, and I hope that every person who has had direct experience with this weed will take part and give us the benefit of their views.

W. S. Fraser: I have had experience with the Sow Thistle, but I hope none of you have had the same experience. I have been acquainted with it for a very long time. Some 17 or 18 years ago I was asked to bring a collection of weed seeds to an Institute Meeting, and I did not know Sow Thistle from anything else. There was a small patch of it on a small farm in our township; nobody in our neighborhood knew what it was, but they know now, and perhaps in our part of the country there is as much Sow Thistle as in any place in Ontario, and we think we are pretty good farmers.

There are two ways of killing the weed. One is to detach it from the soil, and another way is to keep it from getting the air, and in a greater or less time the weed must die. We can apply both of these to some extent. There are various ways of doing it. There is one way that is applicable in all conditions. Where conditions and one thing and another interfere with our methods you must have knowledge of the weed and be able to fight it when favorable conditions arise. It does not require as great a length of time to eradicate the Sow Thistle as we think. We are going to be forced back to summer fallowing, and I think it presents about as easy a way as I know of for getting rid of the Sow Thistle. It may be seeded for clover and about the first of June early pasture, and then broken up and kept cultivated. You will find that the Sow Thistle will disappear before the Canadian thistle will. It is more easily destroyed. The Canadian Thistle does not come up so quickly, and you do not have the same opportunity of checking it. We can eradicate with a hoe crop, but not in one season, and if you will follow one hoe crop with another you can get the Sow Thistle completely eradicated.

Short rotation is certainly a good way of dealing with it. Clover and grain and hoed crops. If the weed is so bad that you have practically the whole farm covered with it then you have got to adopt some drastic measure. Co-operation is a great word that the farmers have not yet found out the value of. It is certainly necessary to have co-operation to get rid of this weed. A man may cultivate his own farm just as well as he likes, but if his neighbor, say, five miles away, neglects the Sow Thistle the seed will be carried by the wind and dropped down on his farm, and where they are deposited they grow and become established in one season. The Canadian Thistle requires two season to establish itself. Where we find a Canadian thistle ocupying a patch in the field we give it treatment sufficient to eradicate it the next year. I have very little faith in legislation. We have had legislation on a great many things, and it has been a dead letter. It is an application of the legislation that is required.

There is another question I would like to raise. We have had certain periods in the world's history. In my short career in this world I have seen epidemics in the weed line that have caused considerable trouble. Go back to the early days when I used to have to pull pigeon weed. We used to have fields so over-run with the pigeon weed that we have had to abandon them, and yet we have no pigeon weed now. I do not want to advocate the abandoning of the fight, but I am just introducing the idea to see if there is anything in it.

I believe a particular weed has an effect upon the soil that makes for its own destruction. My reason for saying this is that a man said to me one day, "Sow Thistle is just like other weeds; I had pigeon weed very bad, and now it is all gone. I gave up hoping to get rid of it, but it is gone." It is a matter that might be discussed. The Sow Thistle is the most agressive weed we have in Ontario, and it prevents the growing of crops, and I think it is well that we should do the best we can to get rid of it.

Mr. Howitt: I might say that Professor Day informed me that bare summer fallow has given excellent results on the College farm.

Mr. Lick: In our section of the country I am afraid we have a great deal more of the Sow Thistle than Mr. Fraser has, for some of us have had the third attack of it, and the feeling seems to be getting general among us that there is a time between the 15th of June and the 1st of July, when, if you plow down the Sow Thistle and cover it thoroughly and plant buck-

wheat or some crop that covers the ground quickly, you can practically get rid of the Sow Thistle no matter what the previous cultivation has been.

A field I had that was pretty bad with Sow Thistle was plowed at the right time, the last plowing being done about the first of July, and it was then sown with buckwheat, and I got rid of the Sow Thistle. I had an experience this year with a little weed I do not know the name of, but we summer fallowed it on the 23rd of June and I have seen no more of it, but in a narrow strip seven feet wide that we hadn't finished, the weed came up. I think if you plow the Perennial Sow Thistle down at the right time and sow a quick crop of buckwheat you will get rid of the weed.

A Member: Perhaps it would not be out of place were I to give you a little of the experience which the people of New Zealand had with the California or Canadian Thistle. It is going to ruin some of the finest land that we have in New Zealand. It takes hold of the land, and it is absolutely impossible to get rid of it. They have tried all sorts of methods, treating it with salt, putting straw stacks upon it, thinking that by that means they could kill it. They have pastured it with sheep, and tried other methods without avail, and the government have offered a bonus of something like £5,000 to the man who will discover a specific for killing it. Several specifics have been offered, but all on being tried have been found to be fruitless.

The latest one is electricity. A man has discovered an apparatus by which he can treat the soil with electricity. This electricity will kill all vegetation to the depth of 2 or 3 feet and in an area of about 12 feet square, and as far as I am led to believe this is proving successful and great faith is being placed in it, and the Queensland Government has offered over £3,000 for the invention. I am anxiously awaiting news from New Zealand as to whether this has been found to be an absolute success.

Another Member: We are not very much troubled with the Perennial Sow Thistle, but we are troubled with Twitch Grass, and if any members can give us a remedy for that weed I would like to hear from them.

Prof. Zavitz: The method Mr. Howitt referred to a little while ago has been successful for Twitch Grass. Some eight or ten years ago it appeared in our Experimental Grounds. About a quarter of an acre was completely covered with the Twitch, and we thought of different methods, and finally we tried a different method from the one usually adopted for Twitch Grass. We cultivated the soil in the spring of the year, and then manured the land at the rate of about 12 good loads of manure per acre, worked that to a certain extent and then ridged up the land about 26 inches apart and put in rape. The rape was cultivated occasionally when it was young and grew very rapidly. I do not know any crop more responsive to good cultivation than rape, and it was not long before it covered the ground and in the autumn we took off a crop of rape that yielded 27½ tons per acre, and by this method we completely got rid of the Twitch Grass.

A Member: This fall we plowed shallow and turned up the roots of the weed as much as we could to the frost, and in the spring we are going to put on the harrows and pull the roots from the ground and rake them off with a horse rake, and we are going to continue that until it is time to sow buckwheat in the late summer. If the same results can be obtained by Prof. Zavitz's method it will be much more economical.

Prof. Zavitz: It gives me such a magnificient crop of rape that it smothers everything else. I do not think it would be as effective if you sowed broadcast, because you cannot cultivate the rape. If the land is moist when the seed is sown and you thoroughly cultivate the land before

you sow the rape, then I doubt very much if you would have to use the hoe crop afterwards.

A MEMBER: We have a weed that covers the ground like a carpet. It grows up like a minature pine tree.

Mr. HOWITT: What you refer to is the "Horse Tail," or "Scouring Rush." The roots grow down into the ground very far, and the presence of this weed indicates lack of drainage—water below the surface soil.

A MEMBER: We have quicksand sub-soil.

Mr. HOWITT: It usually indicates that there is water below.

A MEMBER: We have whole fields covered with it, absolutely, and it seems to be spreading.

Mr. FRASER: I think it is an indication of want of drainage. You will find that weed will disappear when you drain the land. There is another weed that spreads at a tremendous rate throughout the Province and that is "Rag Weed." It is very bad along the roads, and in many places the streets and roadways are lined with Rag Weed. Some farmers are not aware of its pernicious effects, and I think it is well to call their attention to it. I can remember the time when I got a specimen of Rag Weed when it was growing at our depot and it was the only specimen around there. Now, you can find it on many farms and on the road sides.

Mr. HOWITT: One point is often missed in dealing with the Rag Weed. You will find it bears two kinds of flowers, one kind at the top and one at the lower part of the plant, and if you take off the top flowers and leave the bottom ones, which produce the seed, you are doing no good; you should be very careful to cut so low that you will remove the lower flowers, which do not ripen seed until late in the season. I think cultivation after harvest is one of the best methods of dealing with this pest.

Mr. FRASER: Where the land is seeded down to clover, you cannot cultivate it after harvest. The method we have adopted is to go over the ground with a mowing machine after harvest and cut it as close as we can before the seeds have developed.

SOME OBSERVATIONS ON FARMING IN SOUTHERN EUROPE.

By G. C. CREELMAN, PRESIDENT ONTARIO AGRICULTURAL COLLEGE, GUELPH.

In the College herd last year one cow produced 20,778 lbs. of milk. She is a large, beautifully built, splendid looking cow, pleasing to the eye from every standpoint, and a great credit to the breed. You can then imagine my chagrin when, by contrast, the first sight that met my gaze in Naples was a herd of Nanny goats driven by a goatherd from door to door, supplying milk "while you wait" all day long.

ITALY.

And yet Italy has been practising the art of agriculture since the early, early days of old, old civilization, hundreds of years before the Christian era began, and agriculture is still the most important industry in Italy, as 85 per cent. of all the Italian soil is productive land. Dairying is not one of the leading lines, however, nor is any other kind of stock raising. Oxen and asses are still the principal beasts of burden, and wine the largest crop.

And yet, the agricultural products of Italy are varied, and in the aggregate amount to a very large total. Remember that Italy is only twice the size of the State of New York, and you will realize that not much land is wasted when the following crops are produced annually:—

	Bus.		Bus.
Wheat	143,400,000	Potatoes	19,360,000
Corn	85,600,000		Lbs.
Oats	19,360,000	Hemp	111,000,000
Rye and Barley	18,400,000	Flax	30,000,000
Rice	26,000,000	Cotton	22,000,000
Other Cereals	18,000,000	Tobacco	7,250,000
			Gals.
Total Cereals	310,760,000	Olive Oil	74,500,000
		Wine	666,000,000

But like the Swiss and the French, the peasant people are a frugal, thrifty race, and while the rich eat wheat bread, the workpeople are content with bread made from corn or rye.

Legumes Everywhere. In looking about, to find out how the fertility of the soil was maintained in districts where live stock was not common, and hence farm manure was far from plentiful, I noticed that everywhere leguminous crops (or pulse), were the rule. I also discovered that in some form it was eaten every day by rich and poor alike. All the time I was in Italy I never once sat down to a dinner without being served with peas, or beans, or lentils, or some other variety of leguminous annual. I found also that the poorer classes consumed large quantities of pulse, it being used to a large extent as a substitute for meat. Where the Irish peasant finds his balanced ration in potatoes and pork, the Englishman, in bread and cheese, the Scotchman, in oatmeal and milk; so the Italian rests content with macaroni and pulse, and the land gets the benefit in restored fertility.

France.

"A little land well tilled" seems to be the rule with the farmers of France. That the policy is a good one seems also to be worked out in practice, for in the past fifty years, while the increase in cereal acreage has been only 25 per cent., the increase of cereals produced has been 70 per cent., showing an increase of one-third in the productions of the soil.

Sheep. Sheep are a very important factor in the agricultural development of France. The Agricultural College at Grignon, near Paris, recognizing the value of sheep to the land, started careful breeding experiments with this class of live stock. Nearly 60 years ago the Merino was crossed with the English Leicester and a breed established known as the Dishley-Merino. This sheep is now found everywhere in France, and I saw one ram that had just been sold for $460. Individual lambs are given personal attention at Grignon. When twins are born one is always taken from the mother and placed in "The Nursery." Here "The Orphans" all feed from a common rack of bottles, ten in a set. This ingenious contrivance saves a lot of time in feeding and seems to please the youngsters very much. These little fellows were given barley-meal and linseed-cake very early.

Cattle. The French are not clever in the breeding of cattle, and the common practice of using oxen for work purposes has seriously interfered, and still materially interferes, with the production of draught horses. There are, however, a very large number of good Hackney horses of carriage size

but saddle type. These have been bred for war, and the breeding is kept up for the same purpose. Good sound mares are distributed by the Government among the militia officers throughout the country who are not in active service, and after three years, for one-third their value, such mares may be purchased outright by said officers and kept for breeding purposes at home. The practice has helped France and Switzerland to keep in the country a splendid lot of breeding mares.

Swine. In France the swine industry is also an important one, and the Berkshire-Yorkshire cross seemed very popular. Two-month old pigs of such breeding sold readily for $8 apiece. I saw a litter of seven, mixed black and white, still "suckers," sold for $56. Pure bred pigs of the same age brought $20 each, and gilts, eight to ten months, from $30 to $40. All young pigs, not intended for breeding purposes, were either speyed or castrated as sucklings, the males at five weeks and the females at three weeks old.

Crops. In France the principal farm crops are:—1, wheat, oats, rye and barley; 2, corn, potatoes and hemp; 3, madder (for dyeing), tobacco, saffron (for flavoring and coloring), and hops.

Tobacco is monopolized by the Government and yields a gross revenue of $75,000,000, but from this must be deducted the cost of manufacture and cultivation.

Switzerland.

You may lie in a hammock under the trees at Montreux, on Lake Geneva, almost any day in January, while a walk of ten minutes will bring you to a place where tobogganning and skeeing are the principal sports. You may pick the most luscious grapes in the valley of the Rhone, and, looking up, see Mont Blanc covered with perpetual snow. You may see a hillside all divided up into small fields or farms, until a bird's-eye view looks not unlike the experimental plots at the Ontario Agricultural College, and yet the farmers look as well fed and thrifty, and appear happier and more contented than the average proprietor of a hundred acres in America.

Owing to difference of elevation, the climate is extremely variable, even in the same localities. Due to the same cause, few countries in Europe, even of larger extent, can boast of a more varied vegetation than Switzerland. In regard to vegetation it has been divided into seven regions. The characteristic product of the first is the vine, which grows up to 1,700 or 1,800 feet above the sea level. The next is the hilly or lower mountain region, rising to the height of 2,800 feet, and characterized by the luxuriance of its walnut trees, with good crops of spelt and excellent meadows. The third, or upper mountain region, which has its limit at 4,000 feet, produced forest timber, more especially beech, and has good crops of barley and oats and excellent pastures. Above this, and up to the height of 5,500 feet, is the fourth or sub-Alpine region, distinguished by its pine forests and maples; here no regular crops are grown. The fifth, or lower Alpine region, terminating at 6,500 feet, is the proper region of Alpine pastures. In the sixth, or upper Alpine region, the vegetation becomes more and more stunted, and the variation of the seasons is lost. The seventh, or last region, is that of perpetual snow. Many parts, even of the lower regions of Switzerland, are of a stony, sterile nature, but on every side the effects of persevering industry are apparent, and no spot that can be turned to good account is left unoccupied. Of the total area, over 28 per cent. is unproductive; of the productive area, nearly 36 per cent. is under grass and meadows. The chief crops are wheat, spelt, rye, oats and potatoes.

"We love liberty and poetry," said one Swiss farmer to me last May. "Our wine presses we call our drawing-rooms and our vats are our library." Every farmer grows his grapes and presses his own wine, and when he has sold his crop he is content to put his surplus cash to improving his little farm and increasing its fertility. Perhaps when our population becomes more congested, and we are forced to live upon a smaller acreage, we shall farm better than we do. We may then fight the weeds that take the place of the wheat, and remove the stones that take the place of wheat, and plow the fence corners that should be planted to wheat, and cultivate and fertilize to the fullest extent, so that we may have more wheat per acre. *Not more land*, but *a little land well tilled*. That seems to be the motto of the Swiss farmer.

Where dairying is practised soiling is generally in vogue. No grain is fed in summer, but after a little dry hay, fed at 5 a.m., the cows are watered, and then fed all the fresh-cut green grass that they will take. The manger is generally filled twice during the forenoon and again about milking time at night. In winter they feed at 6 a.m., and 5 p.m., just after milking.

The cows are generally the Spotted Swiss, or a grade which looks very much like her. Very often they are grey or mouse-colored, but always large and strong looking. At first glance they appear too beefy looking to give much milk, but on a closer inspection you find a good heart girth, indicating strong constitution, a large barrel, or bread basket, and a heavy bone. It is this last feature, I think, that makes them appear clumsier and more beefy in appearance than they really are.

The Swiss farmer believes in the general purpose type, His best grade cows, such as will produce 7,000 or 8,000 lbs. of milk a year, are worth on the market from $140 to $160 apiece, and after they have been milked three or four years they are speyed and fattened and sold for beef, bringing about $100 to $120 each.

Milk and butter average very little higher in price than ours, but the Swiss farmers are more economical feeders; their markets are right at hand, and the dry stock and young stock are sent to the mountains when feed is scarce in the valleys. A great deal of the milk of Switzerland is condensed milk, or is made into cheese, and Swiss cheese is popular all over Europe. It is open, having large air spaces and holes all through it, and is most palatable and digestible. It is invariably pure white and is served every day to every guest at the leading hotels in Italy, Switzerland and France.

Speaking generally of Swiss farming, I would say that their simple living, intensive methods, and their patient industry, in which every member of the family joins, account for the undoubted prosperity of the farmers of Switzerland.

Observations.

(1) The Italian or French peasant would keep fat himself and keep a large family on the wastes and leaks of the average Canadian farm.

(2) The Canadian farmer would give up business rather than have to put up with the great, lumbering oxen and small, pokey donkeys that do most of the farm work in these countries.

(3) The Latin farmer cultivates every foot of his land, has no fence corners, stumps, stones, or other encumbrances on his land.

(4) Many of our Canadian, or at least Ontario, farmers too often plow around, and harrow around, and mow round, and rake around, and drive

around, stone piles that should never have been placed on good land, in the centres of cultivated fields.

(5) The amount of hand labor performed on the farms in Italy, France, Switzerland, and even England, is remarkable, when viewed by a Canadian who has wrestled with the "No hired help" problem.

Now, I shall test the credulity of my hearers. In Italy I actually saw farmers, dozens of them, spading fields for wheat. The rank and file of the farmers know nothing of the improved agricultural implements.

May I be allowed to say, in conclusion, that while I found Italy too cold in April, and France too hot in May, and England too wet in June, Canada seemed just right when I arrived home in July.

PLANT INTRODUCTION AS A BASIS FOR CROP IMPROVEMENT.

By M. A. Carleton, Cerealist, Department of Agriculture, Washington, D.C.

The importance of giving attention to introduced varieties in improving our crops is sufficiently shown by calling attention to the fact that almost all our present crops were at one time introductions. The chief exceptions of any importance are Indian corn, tobacco, tomatoes, potatoes and sweet potatoes. All of our present numerous varieties of wheat, oats and barley have been introduced from the old world, chiefly from Europe and Asia, while the sorghums and rices have come from the warmer portions of the Eastern Hemisphere. All of the important standard varieties of forage plants and fruits have also been introduced. It is quite natural to expect, therefore, that we can look to this process of introduction for very important additions to our present crops. This supposition has been amply confirmed by recent facts to which I wish to call your attention.

Use of Introduced Varieties in Plant Breeding.

Many of the introduced plants have been absorbed directly into our cropping systems and are rapidly assuming their positions among the standard crops without change except such as may come about in the ordinary process of adaptation. Of equal importance, however, is the use of certain varieties in improving our present crops by crossing with native strains. Often such introductions are of an extreme form in cultivation or wild, and cannot be used in any other way. Other varieties, however, such as durum wheat, emmer, certain oats, rices, fruits and forage plants, may be used in their present condition as staple crops and also be utilized in cross breeding. For example, emmer may be used in crossing with other wheats to produce drought and rust resistant strains, and certain native forms of fruits from China may be and are employed in crossing to give hardiness to our own fruits.

Examples of Improved Introduced Varieties in the United States.

I am able to give some important examples of plant introductions into the United States, which I trust will be interesting, because of the fact that for ten or twelve years there has been maintained in the United States Department of Agriculture a distinct division of foreign seed and plant intro-

duction. This division of the Bureau of Plant Industry was at the beginning placed directly in charge of Mr. David G. Fairchild, who at present again has supervision of this work. The writer was chiefly instrumental in the introduction of the grains mentioned in this address, the operations being planned with Mr. Fairchild in the summer of 1898. It is of interest to note the fact that the same week that Cervera and his fleet were being bombarded in Santiago de Cuba in the war which finally resulted in the acquisition of insular possessions by the United States, operations were being planned which resulted in the addition to the same country of some of our most important crops.

It would be impossible in an ordinary address to describe even briefly all of the plant introductions of value made by the United States, and I would therefore call attention only to some of those which have become of the greatest importance in actually increasing the farm value of our crops.

Durum Wheat.

In recent years because of the great demand for new farming lands, a great deal of attention has been given to the exploitation of the semi-arid districts where heretofore it was supposed that practically nothing could be grown with any success. Because of popular interest in these dry lands, naturally the Department of Agriculture was led to investigate the possibilities of crop production on such areas, and it was found that certain crops, particularly grains and forage plants, have been grown with much success for many years in foreign countries in just such districts as these.

One of the most important of these crops, and in fact the greatest addition in recent years to the crops of the United States, is durum wheat, which was obtained from eastern and southern Russia. The area in the United States to which this crop is adapted is very large, including practically all of the region between the ninety-eighth meridian and the foot hills of the Rocky Mountains besides various intermountain districts. Durum wheat was introduced in the spring of 1899, more seed having been obtained two or three times since. The entire amount of seed imported by the United States Government has amounted to about 1,000 bushels. With this seed as a basis together with small amounts of Arnautka or "Wild Goose" wheat grown in our northwestern states, the increase in the production of durum wheat from year to year has been remarkable. No distinct returns are yet made on this wheat, but the estimated production for the year 1907 was between 45,000,000 and 50,000,000 bushels. For 1908 the production appears to be not much greater, but is probably over 50,000,000 bushels, or about one-tenth of the entire wheat production of the United States ten years ago.

This crop has thus given a tremendous impetus to agriculture on the Great Plains, and has largely extended the area of possible wheat production, so that at least 20,000,000 bushels of this wheat is now produced in districts where no wheat had been grown before. Estimating the farm value per bushel to be about 80 cents, it is therefore seen that the actual addition to the farm value of the wheat crop of the United States because of the introduction of this wheat is about $16,000,000 annually.

At first there was great opposition by millers to the introduction of this wheat, which opposition has not entirely ceased, but has certainly weakened to a great extent. A number of prominent mills are now using largely of the durum wheat, and are putting out regularly a durum patent flour. In addition there is a very large amount of the wheat used in the mills of this country for making semolina for the production of macaroni.

The export of durum wheat has reached the figure of about 21,000,000 bushels annually. After receipt of the first consignments of durum wheat from this country there was some hesitation on the part of foreign buyers in accepting it in the future, as some of the first wheat sent was of rather poor quality, but other lots exported since have been very much better, and after it was found that our country could produce as good a product as Russia or Algeria the increase in exports each year was very rapid. An interesting feature aboout this export of durum wheat is that a much larger proportion of it is now shipped to northern Europe than formerly. There is, therefore, an increasing amount being used each year for making bread. A considerable amount now goes to Scotland for that purpose.

It is of importance to note that experiments so far show the Kubanka to be the best of the durum varieties for bread flour.

Swedish Select Oat.

This variety of oat, obtained also from Russia, was introduced at about the same time as the durum wheat. It is a pedigree variety, developed originally in Sweden, and appears to be identical with the well-known Swedish oat called Ligowo. Our seed was obtained after the variety had been acclimated for several years in the St. Petersburg Government, a region rather similar in climate to that of south central Canada and of the northern United States.

This oat is found to be admirably adapted to practically all of our northern states, but particularly the region between and including Wisconsin and Montana. It has become very popular in Wisconsin, and the annual production in that state is now about 20,000,000 bushels, the entire production in the United States being about 30,000,000 bushels. The present farm value of the crop is therefore about $15,000,000 annually. The good qualities particularly characteristic of the Swedish select oat are its great hardiness under adverse conditions of climate, the yield per acre and the weight per bushel. Through a period of nine years in Wisconsin it has yielded an average of from two to five bushels more per acre than other oats. It is strictly of northern adaptation and fails to produce equal to ordinary varieties in districts below 40 degrees latitude. It is especially the kind of oats to grow on high, dry lands that have thorough drainage and even where the soil is rather poor. On low, rich land it will sometimes lodge badly.

Sixty Day Oat.

About two years later another variety of oat was introduced from south central Russia under the name of Sixty Day, which name is not correct, as the period of growth of the oat is ordinarily even more than ninety days. This is an extremely early variety, however, and its value is largely because of this fact, the earliness often enabling it to escape drouth and attacks of fungi and insect pests which would otherwise seriously damage other varieties before their maturity. This variety does not interfere in its adaptation with the Swedish Select, as it is suited to an entirely different area, chiefly the middle west of the United States. As a matter of fact, however, it is much more of a general purpose oat than the Swedish Select and succeeds very well in a large portion of the country. The Early Burt is better in the extreme south and the Swedish Select in the extreme north and west.

The appearance of this oat is very deceiving with respect to the actual weight of the kernel. The kernel is slender and pointed, but the hull is so

thin and the proportional weight of the "meat" is so great that the weight per bushel is ordinarily very good. In wet seasons it tends to become yellow, so that the grain buyers sometimes object to it on this account.

About the same time as the introduction of this oat, the variety Kherson was obtained from Russia by the Nebraska Experiment Station. This oat comes from about the same area as the Sixty Day and resembles the latter so much that it is believed that they were originally identical. These two oats have become very popular in the districts comprising Kansas, Nebraska, Colorado and South Dakota, and are now in great demand for seed.

Hard Winter Wheats.

The Kansas Turkey winter wheat is now a well known product in that state and is pretty well known even in Canada. During the past ten years our Department has introduced several much hardier strains of this class of wheats, one of which, the Kharkof, is found to survive the winter and the drouth considerably better than the ordinary Turkey. The correct name for this entire group of wheat strains is Crimean, the seed having come originally from the Crimea. The Kharkof strain having been grown much farther north in Russia has become adapted to more severe conditions of drouth and cold. It is particularly resistant to a combination of these two conditions. The use of the Kharkof strain has recently made it possible to grow winter wheat in a considerable area in Southern South Dakota and in practically any portion of Nebraska and Iowa, which condition was not true ten years ago.

Winter Emmer.

The peculiar class of wheats correctly called emmer, but generally known erroneously as spelt, has become rather common throughout Canada as a spring grown grain. It is grown also to a large extent in the United States. Recently a variety of this grain has been introduced by the United States Government which is perfectly hardy during the winter and succeeds wherever winter wheat can be grown. As in the case of winter wheats, the use of this variety permits a much larger yield per acre and at the same time allows a considerable amount of early winter pasturing. It is therefore an introduction that will soon become of great value to the farmer as a crop for stock raising. Recent experiments by different experiment stations have shown that emmer used as stock feed is almost equal to barley or oats.

Sorghums.

All the sorghums, both those used for grain and for forage, are characteristic crops of warm, dry latitudes, and so far are not of much importance in Canada. The success of their introduction into the United States, however, is very good evidence of the value of giving attention to introduced varieties. Over large areas of the southwestern plains of the United States grain sorghums, including particularly Milo and Kaffir, form the main crop, the one that can be relied upon year after year even where the rainfall is as low as fifteen inches annually. Feeding experiments with cattle and hogs have shown that these grains do not fall much below corn as a food for fattening. Selection experiments extending through several years have resulted in producing strains of Kaffir much shorter in their season of growth than those formerly grown, so that it is now possible to grow this crop on a much

larger area than formerly. Recently an entirely new crop of grain sorghums, known collectively as Kowliangs, has been introduced from China. These naturally have a shorter period of growth than other sorghums, and for this reason may be of great value in the agriculture of the middle Great Plains.

Japan Rices.

A very striking example of quick results obtained through the introduction of new crops is shown in the Japan or Kiushiu rice introduced by Dr. S. A. Knapp at the close of the last century. This rice has been found to be well adapted to the States of Louisiana and Texas. The chief advantage however, in the introduction of this crop is that this variety is so much more easily milled than the rice heretofore grown. The shape, size and texture of the grains permit it to be easily milled. For this purpose, therefore, it commands a little better price than Honduras rice, though many people still prefer the Honduras. The production of Japan rice ranks well with that of Honduras in our Southern States.

Drought Resistant Alfalfa.

The Turkestan alfalfa is now well known throughout North America. The first seed of this strain of alfalfa was obtained by Prof. N. E. Hansen, acting as agricultural explorer for the U. S. Department of Agriculture in the region around Tashkent in Turkestan in 1898. It is now handled regularly by the seed trade. This variety comes from a district of very small rainfall and is therefore very resistant to drouths. It is also markedly cold resistant, being one of the decidedly hardy strains. The introduction of this strain has improved the possibilities of the production of alfalfa in the drier portions of the United States by extending it over a larger area than formerly, and has thus been a means of greatly increasing alfalfa production.

The Grimm alfalfa of Minnesota, originally from Germany, and probably the hardiest alfalfa of all, is now known to be identical with commercial sand Lucerne, long known for its ability to resist drouth and to grow in poor, sandy soils.

Arabian and Peruvian alfalfas are both exceedingly promising in the extreme northwest. They not only grow much more rapidly than other alfalfas, but also grow later in the fall and earlier in the spring, so that from one to four more extra cuttings of hay have been obtained.

Cactus as a Forage Crop.

During the past five years it has been proven that in the vicinity of San Antonio, Texas, which is representative of a large stretch of territory, the lands are capable of growing under cultivation from 20 to 25 tons of cactus or prickly pear to the acre per annum, making a succulent forage that can be fed to stock any day of the year. A few people are now planting the crop, and it is more than likely that many more will plant as time goes on.

In recent years from 20 to 30 varieties of spineless forms of cacti have been introduced from the Mediterranean regions of Europe, Asia and Africa as well as from Mexico and South America. A dozen of these grow rapidly enough to make them promising as a forage crop. These are now being grown at Chico, and will be distributed and tested during the coming two years, the investigations being in charge of Dr. David Griffiths. These species are adapted to the region extending from the Sacramento Valley in Cali-

fornia southward and eastward from the southern Sierras to about the region of Tucson, Arizona, and extending southward along the Colorado River approximately to "The Needles." Another region extends along the immediate coast of the Gulf States. Outside of this region no spineless forms are hardy

The Smyrna Fig.

This fruit, though of no importance to the agriculture of Canada, will serve as another good example of the benefits from the introduction of foreign plants. This fig has proved to be well adapted to southern Arizona and California. The most interesting feature about this introduction is the corresponding importation by Mr. W. T. Swingle of the Capri fig insect, which is necessary in effecting the pollination of the fig flower. It was soon found that the introduction of the fig itself was barren of results without bringing with it this insect. The investigation of the habits and work of this insect by Mr. Swingle in conjunction with the entomologists of the Department is a very interesting portion of the history of plant introduction in the United States. The economic results of this introduction are that the fig industry to-day in California and Arizona is a very important one.

The Date Palm.

The introduction of the date palm corresponds very well to that of the Smyrna fig conducted during about the same period, and chiefly by the same explorer, Mr. Swingle, who has published a complete monograph of the botanical characteristics, drought resistant qualities, nativity, methods of culture, etc., of this tree. There are many varieties concerned in this introduction, coming chiefly from Algeria and Tunis, of which the most important one appears to be the Deglet-noor, so called by the Arabs. The introduced trees are grown chiefly in Arizona and Southern California.

Chinese Explorations.

More recently some very thorough explorations have been made of eastern and northern China proper, extending also into Manchuria and Mongolia. No extended trials have yet been made of the plants obtained in these explorations, but a number of things discovered are extremely interesting, and are likely to be of great value. The greater part of this work has been done by Mr. F. N. Meyer, who will continue his work during the present year. Some of the things of great promise already obtained are various dry-land rices, hardy and hulless oats, a seedless persimmon of great size and mild flavor, and numerous specimens of wild types of the pear, peach and apricot; also specimens of the Chinese chestnut.

Introductions of Interest to Canada.

A number of the grains mentioned have already been found to do fairly well in portions of Canada, particularly the Sixty Day and Swedish Select oats. The Kharkof wheat also appears likely to do well in certain localities in comparison with other winter wheats. Some of the oats, barleys and fruits now being obtained from China promise to be adapted to certain portions of southern Canada, and it is expected during the coming year to give particular attention to fruits from Mongolia and Chinese Turkestan, among

which are likely to be varieties well adapted not only to our northern States but to different portions of Canada. Mr. Fairchild assures me that so far as any of these may be found suitable they will be available for use in Canada as well as in the United States.

PROF. ZAVITZ: I am sure we have been very much interested in this address by Mr. Carleton. I have known Mr. Carleton and his work for a long time, and I am sure we cannot but admire the large way they do things in the United States. I must say that Secretary Wilson and Mr. Carleton and all those in the Department have been exceedingly kind. If we have asked for anything that they have brought in from other countries, they have been willing to divide with us as soon as a sufficient quantity has been available and they have frequently asked for our co-operation. Although we have not done very much with the figs and the dates, we have been carrying on some experimental work with the varieties of grains that Mr. Carleton has referred to. The Swedish Select oats seem to do very well in the northern States, but so far they have not done very well here at the College, where we have had them under experiments along with a great many other varieties. The Early Kherson and the Sixty Day we have found very good early varieties of oats, and I would like to ask Mr. Carleton whether they are white or yellow. The seed we obtained was very badly mixed, and we separated the white and the yellow and both strains are coming true, and I am at a loss to know whether the Kherson and the Sixty Day varieties of oats should be yellow or white.

Mr. CARLETON: I think they were originally mixed; I think the majority are yellow.

PROF. ZAVITZ: We have one other variety of oats at the College which is a little earlier than either of these; namely, the Early Ripe. So far, the Early Ripe variety has been almost immune to the attacks of smut. It is the only variety we have grown that seems to be immune to smut, and we are using it to cross with other varieties in order to see if we can introduce the immunity to smut in the other kinds.

The Hog millet, referred to by Mr. Carleton, is quite similar in its nature of growth and in its characteristics to the Japanese Panicle variety, which we have grown here for a number of years, and on which I reported yesterday. The Japanese Panicle has proven superior to the Hog millet as a fodder crop for Ontario.

The Kaffir corn, referred to by Mr. Carleton, has been grown here for a number of years, but we have found that our climate is rather too short for its development. We obtained one variety of Kaffir corn from China last spring which gave promising results. It was the tallest of the thirty varieties of sorghums which we grew in 1908.

I obtained from the Department at Washington and from other sources, alfalfas from a good many countries, numbering in all about twenty-eight or thirty different strains. The experiments have been in progress for four years. The Arabian and the Peruvian seed germinated very well and the crops made good growth the first summer, but both strains almost completely killed out the first winter. The Turkestan Alfalfa from imported seed has given very good results, but that from seed obtained from the American seed trade has turned out very poorly indeed. The Grimm Alfalfa and the Sand Alfalfa we have under experiment in 1908 for the first time.

We have had seven or eight varieties of durum wheat under experiment at the College for about fifteen years. The Wild Goose variety of durum wheat has given the best results, and we have used it extensively

in our co-operative experiments throughout Ontario. It is now grown in general cultivation in some parts of Ontario.

The Black Winter emmer, which has been grown at Guelph in each of the past two years, seems very hardy and is giving good results.

I thought I would thus briefly refer to these things, and give you our own experience with some of these crops which have been so ably described by Mr. Carleton. I am sure we are greatly pleased indeed to have Mr. Carleton with us, and to tell us what they are doing in plant introduction in the United States. I wish to move a hearty vote of thanks to Mr. Carleton for coming to us from Washington and for being with us, and for helping us so much at this, our annual meeting.

Prof. Hutt: I have very much pleasure in seconding that motion. Mr. Carleton referred to some fruit as well as grain, and I have been very much interested in his address.

The motion on being put to the meeting was carried with applause.

Mr. Carleton: I thank you for the pleasure it has given me to be here. Of course our introduction of plants have not been for Canada, because we do not live in Canada, and quite a number of those that would be hardy in the United States will not be hardy in your country. I think, however, that we will get strains of Alfalfa from Siberia that will be hardy in Canada, and better in this respect than those from Europe or from Turkestan.

FARMERS' INSTITUTE CLUBS.

By G. A. Putnam, B.S.A., Superintendent of Farmers' Institutes, Toronto.

The markedly beneficial results, both to the individual and to the community, following the organization of farmers for the purpose of studying, discussing and debating agricultural problems, and improving themselves in a literary and social way, at a number of places throughout the Province, years ago, even before Farmers' Institutes were organized, and the benefits resulting from the work of similar societies formed within the past few years, gives us assurance in bringing the question of Farmers' Institute Clubs prominently to the notice of the farmers of Ontario. The Department of Agriculture is much gratified to learn of the success attending the work of these Clubs during the past two years in many sections of the Province, and we believe that the good work being done by the Farmers' Institutes of the Province can be strengthened very materially by local organizations in those neighborhoods where even a small number of interested and enthusiastic farmers will band themselves together for the purpose of studying the possibilities of agriculture in their respective localities.

Institute delegates, and others who have had the opportunity of observing, have commented, time and again, upon the high degree of intelligence, and the up-to-date methods in those districts where opportunities have been afforded for the holding of periodical meetings for the purpose of discussing matters bearing upon the work and business of the farm. Many of the present day leaders in the agriculture of the Province are men who attribute much of their success to the early opportunities afforded through literary and debating societies and clubs organized for the study of agricultural matters and the comparing of notes with their neighbor farmers. Most of you are no doubt aware that the defeated candidate in the late presidential election has been a member of what corresponds to a Farmers' Institute Club for the

past twenty-five or thirty years. A good deal of his ability as a public speaker is attributable, no doubt, to the training which he received in this Club in his earlier days.

It is gratifying to note the spirit of enquiry among the farmers throughout the Province. The farmer who produces milk is now showing a desire to know as to whether or not the individual cows in his herd are being kept at a profit, how his herd can be improved, if he is receiving his just share of the price paid by the consumer for the milk, butter or cheese purchased in the retail store; the fruit men are fast adopting those methods of cultivation, spraying, packing, etc., which will insure them the greatest production and the highest prices; and the tillers of the soil generally are awakening to the fact that they must proceed on business lines and apply scientific principles if they are to receive just returns on the capital invested and for their toil. We believe that many are ready for the formation of organizations through which they will be the better prepared to improve their stock of agricultural knowledge.

There are usually a small percentage of farmers in each locality who are producing a superior quality of roots, grain or fruit, and who are practising successful methods in cultivation, feeding, breeding of live stock, milk production, etc. If the methods followed by these successful men were more generally known, a greater number of farmers in the vicinity would adopt similar methods. Then again, many farmers who consider the products which they are raising from year to year of superior quality, would, if they had the opportunity of comparing notes with their neighbor farmers, find many ways and means of improving upon their present methods, and thus secure even better results and increased profits. We wish to afford the farmers a means whereby they will have an opportunity to make the best application of the great fund of agricultural literature which is within the reach of all, to utilize to best advantage the services of lecturers sent out from the Department of Agriculture from time to time, to exchange views on the results of methods adopted by the farmers of the locality; in short, to furnish a means whereby the farmers will have a systematic and attractive method of studying their own business in their own way.

The work of the Clubs, so far as agriculture is concerned, need not, and should not, be confined to a discussion of methods for increasing the amount of produce per acre, the more economical feeding of animals, etc., but should also include co-operation among the producers of the district in the matter of purchasing supplies, and in the production and selling of grain, roots fruit, live stock and other farm produce.

We believe that in Farmers' Clubs will be found the opportunity for self improvement, for the farmers of Ontario, which cannot be secured in any other way. It is at once a simple and effective means to a desired end, and at comparatively no cost to those reaping the benefits. It is a means by which the information which is now placed in the hands of the farmers through the reports and bulletins of the Department, and the standard agricultural papers of the Province, as well as the leading weeklies, may be utilized to the best advantage.

It must be remembered that the degree of success attending this work will depend almost entirely upon the efforts of local men. Successful farmers who have enthusiasm and ability, and who are willing to devote time to the work, should be placed in office. Arrangements should be made at each meeting for definite subjects to be dealt with at the following meeting, or, what is better, a programme of topics with speakers prepared some months in advance.

The objects of Farmers' Institute Clubs are to encourage and maintain a better and more general and intelligent interest in all that pertains to agriculture in the broadest sense, by holding meetings at which farmers may receive and give information, suggestions and experiences, and study together how best to improve themselves and to help their fellow farmers; also to afford an opportunity in debate and study for members to become accustomed to public speaking, and to help develop talent along those lines that might otherwise remain dormant; to have them present addresses upon subjects relating to farming and dealing specially with the conditions existing in the locality; to increase the knowledge of and interest in the larger questions (not sectarian or political) of the nation, and which affect the social life and financial position of the farmer; to create and stimulate an ambition in our farmers, and especially the younger men, to be successful in the truest sense, and to not only raise the calling of the farmer to the place it should occupy in keeping with its importance in the state, but also to make use of his successes, opportunities and power, to make Ontario a still more desirable Province to live in.

Up to the present we have advised that a portion of the regular membership fee to the Farmers' Institute be retained for local club purposes. This has not proved very satisfactory, and we advise each club to set a fee which the officers consider necessary to cover local expenses, and those who wish to join the regular Farmers' Institute may do so by paying 25 cents to the Secretary of the Farmers' Institute for the riding. In many cases several from the one household wish to attend the club meetings, and it is necessary for only one to get the literature sent out by the Department. When the membership fee to the Club and Institute are not distinct and separate, confusion and difficulty arises.

Those Clubs which hold at least five meetings a year and report the same to the Superintendent of Institutes, and which have at least twelve members who also belong to the riding Farmers' Institute, will be entitled to a speaker for a special meeting, free of cost to the Club, except for transportation to and from the railway station and entertainment while at the place of meeting. Clubs will, no doubt, be able to get speakers through the local Farmers' Institute for a meeting to be included in the series of Winter meetings.

We trust that the ex-students of the College and others who are connected with this union, will take sufficient interest in this Farmers' Institute Club movement to discuss the matter with the farmers in their respective localities. We believe that you cannot do a better service to your fellow farmers and to yourselves than by providing a means through which an opportunity will be afforded for the study and discussion of agricultural problems in your respective localities.

I have not time to go into particulars in a short address, but shall have pleasure in mailing to any inquirers fuller information as to methods of organization, etc. Let me offer a few suggestions, however:—

Do not attempt to hold too many meetings the first season. Experience has shown that you will have a stronger Club by having four or five rousing meetings the first season, and then get down to regular and probably more frequent meetings the next year.

Political and sectarian questions should, we think, be avoided at all time in connection with Farmers' Institute Club work. It is strictly against the rules to discuss such matters when delegates from the Department are in attendance. We are strongly of opinion that there will be enough and to spare of purely agricultural subjects to occupy all the time which the farmers are able to devote to Club work.

In addition to the general directions given in the by-laws as to the work to be undertaken by the clubs, we beg to make some more specific recommendations. The nature of the work to be undertaken in each locality must, of course, depend upon the lines of agriculture which are followed successfully in the locality. If dairying is one of the chief sources of revenue to the farmers, then it would be well to have a committee to deal with dairying. This committee could well inquire as to who in the vicinity was making regular tests of his cows, and make arrangements with the owner to present the results of the work to the club for discussion. They might also carry on some sort of inquiry or line of experiments by which the cheapest method of feeding for the locality could be determined. It would also be within the province of this committee to make some arrangement by which sires produced from ancestors of well known dairy qualities could be introduced in the neighborhood. The proper care and handling of milk, and the sanitary surroundings of stables, milkhouses, factories and creameries should receive the attention of the organization.

Special work with reference to the breeding and care of horses, cattle, sheep, or bacon hogs should of course, receive consideration where any of these classes of animals are produced in anything like large quantities.

Have the committee on experiments canvass the members of the club, as to the experimental work which each will be prepared to take up. In this way unnecessary duplicating can be avoided and a wider range of work may be undertaken and the efforts of the individual will be of benefit to the whole community. The Club could with profit have one or more of its members conduct each of the experiments sent out by the Experimental Union from year to year and the reports of those experiments would form a valuable basis for addresses and discussions the following season.

We would strongly advise that the Farmers' Institute Club, and the local branch of the Women's Institute, co-operate in social gatherings occasionally. In fact, it might be well for the two organizations to have union meetings every two months, or oftener, if thought desirable. At these meetings more or less attention could be given to literary studies, music and debates. It will be advisable for these two organizations to co-operate in getting up entertainments or suppers with a view to raising funds to carry on the work.

The time has come when Farmers' Institutes must devote more attention to the holding of special meetings, that is, meetings at which one subject is taken up and dealt with in a thorough manner. The work of the Clubs will, no doubt, tend to strengthen this feature of the Farmers' Institute work. If the clubs grow as we expect to see them grow, it will call for a re-organization of the Farmers' Institute system whereby it will approach the methods now followed in conducting the Women's Institutes. The results attending the work of Farmers' Institute Clubs during the coming winter will be a determining factor in this proposed re-organization.

Mr. Munroe: Last year I held a number of classes throughout the county, and one of the most satisfactory results I see in them this year is the fact that the farmers in very many localities are wanting to come together and form organizations for the discussion of agricultural subjects, and I see in this the beginning of real co-operation among farmers. It looks to me as though farmers should co-operate better than tradesmen. When a man enters the shoemaking trade all the other members of the trade have less opportunities for selling their goods because of more competition. In farming this is not true. If a farmer in one community is engaged in horse-raising, and if the whole community engage in raising Clydesdale

horses, it would be to their advantage because the buyers know where to go to get Clydesdale horses and they will go to the locality where they will get the greatest number. I should like to mention advantages of the Farmers' Clubs, and to give you an instance of what occurred in Dundas County. A man there wanted to get potatoes. He came into the community and searched nearly all day, and was about to go home without his potatoes, when he chanced on a man who had some twenty bushels to sell, and who had been trying to sell them for two weeks. The question arose why should not they have come together sooner; and now they have organized a directory whereby every farmer who belongs to the Club is at liberty to register whatever he has to sell, whether horses, cows, pigs, grain, machinery or anything else. An outsider coming into that locality can go to that directory and find out who has produce to sell and make a direct purchase without waste of time. I think that is one of the latest improvements in agricultural education.

Mr. McKenny: I do not know that there is very much that I can add to what Mr. Munroe has said. We have some Farmers' Clubs in the County of Essex, and they have been very successful among the farmers in that district. From a business standpoint I think these clubs could be made of some practical value to the farmers, such as in the instance pointed out by Mr. Munroe. A great deal of corn is raised in Essex that could be sold for seed purposes. There is a great demand for this corn in the east, and what we are going to try and do is to co-operate with other Farmers' Clubs and get a list of our members who have corn for sale, and there is no reason why other Farmers' Clubs should not be able to buy this corn and do away with the middleman's profit. That is one of the things we are going to take up this year.

Mr. Hart: The subject of Farmers' Clubs is certainly an important one but I do not know that I can add very much to what has already been said. We have done considerable work in organizing these clubs in Waterloo County. One or two were already formed when I went there and I think the best thing we can do is to help them along, and we have been advocating the formation of these clubs. I have been at quite a number of their meetings, and at every one of them the discussions have been as good as you would hear at any Farmers' Institute meetings when the regular Institute speakers are present. I have been more than surprised and pleased at the way the meetings have turned out. Men who had never been on their feet before have developed into good speakers. We now have eight or nine clubs organized, and we are in hopes of getting the whole County organized in this way and we are going to try to have meetings once a month.

SOME OF THE RESPONSIBILITIES OF CANADIAN CITIZENSHIP.

By Dr. J. S. Willison, Editor *"The News,"* Toronto.

After a little pleasantry by way of introduction, the speaker proceeded to say:—It is a great pleasure to me for the first time to speak to the students of this great institution, an institution which in my humble judgment—I say it in all sincerity, and I have said it many times—is doing more for the well-being and the good reputation of the Province than any other institution within its bounds. (Applause). It is a pleasure also to meet the ex-students, who from year to year have gone out from this insti-

tution and have done so much to improve the material conditions of this Province, and to give to the agriculturists of Ontario their foremost position among the farming communities of this continent. I can remember many years ago, when I used to sit in the gallery of the Legislature representing a Toronto newspaper, that this Agricultural College was not held in the esteem in which it is held today; and I have watched with great interest its progress down the years, and its gradual growth in the confidence of the farmers and in the general esteem of the community; and I think we can say today that it is not only distinguished on this continent, but distinguished the world over, as the best agricultural institution in existence. I have heard that statement made in all sincerity by men entitled to speak from other countries, and I think the student roll proves that the statement is well within the fact. I was born on a farm, but if any one writes my biography, which is unlikely, I hope they will omit the agricultural record. I was not responsible for being on the farm; I left the farm as soon as I could—I imagine in my own interest and in the interest of agriculture. I became a journalist, and, therefore, entitled to speak with authority on agriculture.

I want to speak to you briefly but very plainly, if you will permit me, on some of the responsibilities of Canadian citizenship. You all have heard that this country touches on two oceans, and that we have majestic mountains and wide leagues of prairie, and rich forests and rolling rivers, and vast mineral wealth, and a climate which nourishes a superior race of men, and he would be an ill-conditioned Canadian who did not esteem this venerable peroration or who did not rejoice in this splendid inheritance. We have, as was said of old, "a land of brooks of water, of fountains and depths that spring out of valleys and hills; a land wherein thou shalt eat bread without scarceness, thou shalt not lack anything in it; a land whose stones are iron and out of whose hills thou mayest dig brass." But we made none of these things. A bountiful providence gave us our wealth of coal and iron and timber and fisheries and waterways. They are not the creation of any political party; they are not the legitimate possession of any Government. Our responsibility lies in the use we make of these resources, in the wisdom with which they are administered, and in the foresight with which they are conserved and developed for the advantage of this and future generations. A good many crimes are committed in the name of progress and development, and it is a spurious patriotism which concerns itself only with the material side of the Government. What I am trying to say is that we are responsible for the character of our free institutions, for the temper of our politics, and for the official and industrial conditions which prevail in Canada, and that we can take no credit to ourselves for the wealth which we did not create, nor for the advantages of soil and climate which naturally belong to this country. It should be possible in this new country, with the experiences of ages at our command, and with our vast natural wealth available as permanent sources of revenue, to build here a better civilization than any the world has known. If labour is not well paid and agriculture well rewarded, and the rural communities well served with schools and roads and mailing facilities and railway services, and the cities clean and wholesome, all other achievements have a secondary value. There is no particular virtue in a railway 5,000 miles long or 10,000 miles long. The test is in the service, and not in the length. When they shot the wrong man in a western mining camp they undertook to correct their mistake by organizing a gorgeous funeral for the remains, and they drove the body four or five times around the town, on the theory that in order to make a funeral a success you must have distance. Now, if you have the necessary extent of territory,

adventurous capitalists, and public credit, it is not difficult to stretch a line of steel across a continent, and from the purely national and imperial standpoint we would have reason to rejoice in the achievement; but the substantial value of the road is in the regularity and the efficiency of its service, in the standard of its freight and passenger charges, in the scale of wages, and the running regulations which affect its workmen, and in its general attitude towards the communities which it has the power to retard or to develop. And I sometimes ask myself if railway building in this country is to be forever a pauper industry, and if some of the glory which we ascribe to railway capitalists and railway builders does not belong legitimately to the workmen and the farmers and the trading classes who still contribute millions and to bear heavy burdens on account of the creation and maintenance of the railway services of Canada. There is national value and national reputation in a great through railway system, with fast trains and solid roadbed and double track, and Pullman and parlor coaches and dining cars, and all the comforts and conveniences of modern railway equipment, but the railway has not discharged its duty to the community unless it also provides regular and adequate service, comfortable coaches and decent station accommodation on the branch lines of its system. More than that, if the railway company fails to meet its legitimate obligations to local communities it is the duty of the Government, acting directly or through the Federal Railway Commission, to require the Company to improve its service and its accommodation and to fulfil fairly its contract with the communities affected. I know Western Ontario as well as most men, and I think it can fairly be said that for the last thirty years, a period peculiarly distinguished for social and industrial progress, and during which the through railway systems have undergone a revolution, there has been practically no improvement in the operation and the equipment of the branch railway systems of Ontario. The fact leads inevitably to one of two conclusions, either that the people are contented with conditions as they exist and have laid no obligation upon their representatives in Parliament, or that there are influences at Ottawa more powerful than the unorganized opinion of the constituencies. It is also a noteworthy fact that no progress has been made in the movement to abolish level crossings, although it does seem to me that if there is one question which demands imperatively the early and effective attention of parliament it is the development of a scheme for the abolishment of level crossings throughout the whole country. Nothing is further from my mind than to denounce public men or suggest that the parliament and legislators of the country are careless of the public welfare or neglectful of the great interests committed to their keeping. I know it is very often said that our politics are coarse and violent, and that the virulence of newspaper writers keeps many good men from devoting themselves to public affairs. I have the opinion that the plea is generally made on behalf of weaklings and incompetents. No newspaper or combination of newspapers ever killed a public man who deserved to live, or ever gave permanent distinction and authority to a public man who was not worth saving. I admit public service is an ungrateful service at best. There would be few of us either in newspaper offices or in parliament devoting ourselves to the public service if the only reward we expected was public gratitude. I say that not by way of complaint, but as a mere statement of fact, for the man who deliberately selects his lifework and whines over the doing of it is not worth his salt.

But there are evils in public life which deserve to be denounced, and there are charges which lie fairly against the public men of the country.

Too often the parliaments and legislatures have to be driven by public opinion, and they give grudgingly and reluctantly the measures of reform in the advocacy of which they should be the pioneers. It required a newspaper campaign extending over many years to induce parliament to establish the Federal Railway Commission. It was mainly in response to outside agitation that the jurisdiction of the Commission was extended to the telgraph and telephone companies. Civil service reform was practically imposed upon parliament by outside agitation, and even yet the reform has not been applied to the outside service where the chief abuses of patronage exist. In the work of reform the fourth estate has become the first estate, and if the fact is an honour to the press it is not a credit to parliament. I do not suggest that governments should introduce revolutionary measures without consultation with the public outside, but I do contend that governments should not be mere registers of public opinion, and should not tolerate abuses until public wrath forces politicians to act out of pure concern for political safety. There should be agitation for reform in parliament as well as outside. There should be independent speech and aggressive action there as well as in the constituencies. There should be pioneers of progress there as well as in Boards of Trade, in Labour Congresses, in farm organizations, and in newspaper offices. Is it too much to expect that now and then governments will go in advance of public opinion in order to pass progressive legislation and to further desirable social and political reforms? If governments will risk public displeasure in order to grant bounties to private interests, to protect corporations, to vote millions in railway subsidies, to maintain the patronage list and the patronage system with all its abuses and evil tendencies, is it too much to expect that now and then they will venture to risk public displeasure in order to redress public grievances and to abolish time-dishonored practices? Sir, the member of Parliament who serves out his term, and on going back to his constituents for re-election can say for himself only that he never spoke except as he was instructed by party, and never voted except as he was directed by party, and that through the whole parliamentary term he linked his name to no measure of reform and made no good cause the stronger by his presence in the public councils, should never have gone to parliament at all and should not be permitted to go again. We Canadians boast of our British traditions and rejoice to belong to an empire which has been the pioneer of free institutions the world over. The concrete expression of all that Great Britain has done for the world's civilization is the Free Ballot. As Whittier said in words which the Hon. Edward Blake was fond of quoting, "The crowning fact, the kingliest act of freedom, is the free man's vote." For the ballot, which represents the freedom and independence of the citizen, Great Britain has fought bloody battles for centuries, has overthrown tyrants at home and tyrants abroad, and has scattered the bones of her sons over the whole earth, and yet there are those amongst us who sell the ballot for two dollars or five dollars or ten dollars, according to the condition of the market. It is not surprising when a shiftless tramp or some poor devil on the verge of beggary sells his vote for two dollars; but it is discouraging when public appropriations, dangled as bribes before well-to-do citizens, corrupt a whole constituency. Besides, the public money is extracted impartially from the pockets of all parties and all classes, and it is a solemn obligation upon governments to devote it to common public offices. Moreover, the system unavoidably breeds waste and extravagance, corrupts the public morals, and burdens the general body of taxpayers. There is great need in my opinion to reduce our whole system of public expenditure. Public improve-

ments are placed where they are not needed; buildings are erected far more costly than the volume of local business warrants. Tens of thousands of dollars are spent on armories which are never used, or seldom used, and which serve no national purpose, millions are voted in subsidies to public services which private initiative and private enterprise should supply, and the public taxes are made the campaign funds of politicians. If we look back to the struggle for the first reform bill in Great Britain, and to all the glorious expectations associated with the dawn of democracy, we shall at least be forced to conclude that all the results have not been exactly according to the expectation. No one believes more firmly than I do that the world grows steadily better, and that generally the pessimists have been confounded and the optimists justified; but there is a vast work still to be done in improving representative institutions, in ameliorating social conditions and in equalizing the public burdens, and for my own part I do not look to the clubs, nor to commercial bodies, or even to the universities, chiefly for public spirit and moral energy, but to the men in the shops and on the farms, who all down the years have been the bulwark of every free nation and the support of all solid and enduring social and industrial progress. As I have said, there is so much still to be done—as Cecil Rhodes expressed it, "So much to do and so little time to do it." In Great Britain there are ten or twelve millions of people absolutely without the means of livelihood. The unemployed cluster in thousands in the great cities of the United States. The same problem touches us in Canada, and in Toronto we are facing the winter with grave apprehension. Now, I do not pretend to know the remedy for this periodical affliction of millions of the human race, but I do not believe that the misery of the poor will endure forever, and that down to the end of time this old earth will be a place of torment for multitudes of its inhabitants. We sneer at Woman Suffragists and Socialists and the apostles of revolutionary social propaganda, but let us not forget that, wild as some of their schemes may be, and intemperate as some of their utterances often are, they have a consuming zeal to abolish social and industrial evils and to make the world better. The cranks and the faddists and the disturbers have been the driving wheels of civilization, and always the men whom we crucify today, we crown tomorrow. I heard Edward Atkinson, of Boston, say a few days before he died, that for fifty years of his active life he had been denounced as a crank, and that for the last few years of his life he was honoured as an authority. So it has been all through the ages; and if the breed of rebels ever dies out this earth will become either too good or too bad for mere humanity to live in. In this country, even with all our natural advantages, our admirable system of free government, our high average of material comforts, and our high standard of popular intelligence, there still is need for rebels to war against political abuses and social injustices and industrial inequalities, and to level up the condition of the masses of the people.

THE STUDENTS AND THE EX-STUDENTS OF THE ONTARIO AGRICULTURAL COLLEGE.

By Dr. C. J. S. Bethune, Professor of Entomology, O.A.C., Guelph.

I feel very highly honored in being called upon this evening to propose what we must all consider the most important toast that could be proposed in an institution of this kind, that is, the health, the welfare, the well-being

the success and prosperity of the present and past students. As the President remarked at the outset, a College of this kind depends very much indeed for its reputation upon the character of the student body, of those who are here and those who have gone out from these walls. If the students are what they ought to be, if they are straightforward and upright, honest and steady in their work, amenable to those in authority, and take full advantage of all the opportunities that are afforded them, and when they go out from this place, if they maintain a high standard of work and conduct wherever they may be situated, then we feel sure that the College will be a success and that its reputation will extend, as that of this College has done, all over the world. But if, on the other hand, our men here should be slack in their work, careless in conduct, with no proper feeling of respect for the authorities of the College, it would not matter how splendid our buildings might be, how admirably we might be equipped with laboratories and other accessories of that kind, if the men themselves did not take their proper part and fulfil the obligations that rest upon them. In such a case as that no institution would succeed nor could its reputation last for any length of time.

However, let me turn to the subject of my toast. It divides itself naturally into three groups. First of all, let me refer to one of them, the students of the Macdonald Institute. Unfortunately for me, my acquaintance with those students is exceedingly limited, and has not been quite so extensive as that of my young friends here. I have opportunities of seeing them on the street cars, but unfortunately when I am getting on they are getting off, and I am led to feel somewhat envious of these young men who have the opportunity of travelling up from the town with them. However, I am able to say this much, and I have said it to my friends in Guelph, that if they ever see a fine looking young woman, healthy, robust, with rosy cheeks and the picture of everything a young lady ought to be, they may be quite sure that she is a Macdonald girl!

The second group consists of the ex-students, which, as the President pointed out, includes all those who have ever taken any advantage of the courses of this institution, whether it may be a short one of a few days or a course of four years, they are all our ex-students, they are all members of the institution, and we all look on them as part and parcel of the life and well-being of this College. The President has said a good deal with regard to them, and therefore I may say very little. However, I would like to mention that the College is now 34 years old, and some statistics have been made with regard to the first twenty-five years of that period, and it has been found that half of the students who have gone out each year have settled in the Province of Ontario; in the earlier years of the College there were a large proportion of young men from England and elsewhere who naturally were not likely to remain entirely in Ontario, and they have spread over the West and gone to other parts of the world; but of this 50 per cent. of the students the greater part of them are actually engaged in the pursuit of agriculture on some farm or other. It was considered in days gone by somewhat of a reproach that this College did not train up farmers, but after men had gone through the course here they took up other occupations, and that therefore it was a waste of energy and money to support an Agricultural College which did not turn out a large proportion of men devoted to agriculture. But that, I am happy to say, is a misconception. We find of this 50 per cent. of the students in those first twenty-five years that the greater part of them were genuine farmers and others filled positions on agricultural journals, in forestry work and in various occupations connected with farming. In the Department of Agriculture for Ontario, in the same Department for the

Dominion at Ottawa, in very many different positions, we find that posts are occupied, and well occupied, by students of this College. During the last ten years this proportion has very much increased, although I have no figures at my disposal at present. It is not necessary for me to dwell for any length of time upon the achievements of our ex-students. I trust that the gentleman who is to respond for them will be able to tell you, perhaps, more than I can possibly do.

Let me turn, then, to the third group that I wish to refer to to-night, and that is the students of the present day. I may say that when I came here —I am only now in my third year—I thought that as it was an Agricultural College there would be a good deal of rather raw material, that the common conception of an uncultured plowboy might prevail amongst a considerable number of the students. I had some sort of an idea like that; but I must say that I was most agreeably surprised and delighted with what I found. Friends of mine in Toronto and elsewhere, after I had been here a little while, asked me "What sort of students have you got at Guelph?" and I was able to say that I believed that they compared most favorably with any students I had ever met with in Toronto, and that in some respects I considered them superior. We can truthfully say that they far excel the students in the larger towns as regards behavior. So I am proud to feel, and I am sure you will all join with me in that feeling, that the students of the Agricultural College at Guelph can hold their own in comparison with the students of any other College or University in the Dominion. When I say "hold their own" that brings me to another matter, and I hope that what I am going to say will be entirely agreed with by all of you.

This time last year, you may remember, we were all in a state of highest exhilaration over the success achieved at Chicago when the Bronze Bull was brought back as our property forever. To-night it is evident that there is not quite that feeling of exhilaration, there is a certain amount of depression, that has been visible during the last few days about the College and the campus, and some amongst us, I am afraid, actually think that the College has suffered some disgrace by the small amount of success that was achieved the other day. Now, I would like you to think very differently from that. In these days of strenuous competition there has arisen a feeling that success is everything, and that success must be obtained by foul means sometimes if not by fair, and that the whole thing that we should aim at is, to use the common expression, to "get there," to win, to come out on top. Now, when we come to contests, whether it is on the football field or in athletic competitions, oratory, or music, or in stock judging or anything of that kind, we ought to feel that we must not expect to win every time, that the contest would be no contest at all if the same side always won, and that we must expect to take our share of the defeats when it happens to come our turn. The only thing that can disgrace a College team is their entering into a contest without proper preparation, and then when they are engaged in it without striving to do their best. Now, I know our men who went to Chicago went through all the preparation that they could, and that when they got there they did their level best, but the Fates were against them; there were conditions different from what they expected, and they had to to undertake trials for which they could not be prepared. That was not their fault; that was one of the fortunes of war, and they came out in a lower position than they hoped or anticipated. That will not be the case always, we feel sure; although when we look back on the victories of the past three years it was our turn to lose, and we ought to lose with good grace. It has been said that British soldiers never know when they are beaten, that is to

say, that though they may suffer defeat on the field of battle, they turn around and are ready to fight again. So let it be with us. Don't let us be down-hearted or too much disappointed. Let us nerve ourselves to do better next time, and feel that we have suffered no disgrace, that we have only failed because others had superior advantages, but they had not done any more real honest work or made any better preparation than our men. I must not detain you any longer, but I would simply say to all students past and present, whatever you had to do, whether it is in work or in sport, always "play the game" and play it fair. And one word more—be loyal to one another, be loyal to your College, loyal to your King and country, be loyal to this great empire of which we are so proud, then "play the game, and play it fair."

PRESENT PROGRESS OF THE ONTARIO AGRICULTURAL COLLEGE.

By President G. C. Creelman, O.A.C., Guelph.

It is my privilege, and I deem it a privilege, on behalf of the Officers and Students of this Institution, to welcome here at this time the ex-students of the College. I think that a very happy term which has been applied for long years to those who have come and gone from the Institution. It is not embarrassing to those who came, and through circumstances over which they had no control, left early; it is not embarrassing to those who came for a long course and because of circumstances at home, financial or otherwise, have gone back home before graduation, gotten along well and have helped their neighbors in the doing. That being so, I like the word "Ex-students" rather than Graduates or Associates. I say, the word "Ex-student" is a happy one, and for that reason I welcome back to the Institution any who may have been here a day or a month or have stayed for the four years' course and taken a degree from Toronto University. An Institution of this kind is probably more dependent upon its ex-student body than the ordinary university. At any rate I have no hesitation in saying that the best advertising—if I may put it on that plane—the best advertising this institution gets in this or any other country, is the young men who have gone out from our doors and have taken their places in the business world, be it the business of farming or any of the professions, for they have taken their place, and in season and out of season taken occasion to proclaim the fact that they have once been students of this Agricultural College.

It is the duty of the College President on occasions of this kind, when ex-students are present as our guests, to say something to them as briefly as may be of the progress of the institution and about the character of the student body at the time you happen to be with us. The student body this year again is larger than ever in the history of the institution. In all 1,208 individual students have been here for more or less instruction during the last twelve months. These have come largely, as you would expect, from the Province of Ontario. The counties that have been best represented have been, York 27, Wellington 25, Oxford 14, Waterloo 12, Brant, Wentworth and Middlesex 11 each, then Halton and Ontario each with 10, and the other counties in order all the way down to one from Algoma. So I thought it might be interesting to you to know that the Province of Ontario still keeps up and still sends to us from year to year an increased number of worthy students. When I come to the word "worthy" I hesitate a moment, because

(laughter)—I see some of you know why—because it has not always been so. There was a time when boys came to this institution from the towns and cities largely in this Province of Ontario because they were sent here. They didn't know themselves why they came. Some of them came on very short notice from home, but in my student days, and in the student days of many I see about me to-night, who were here even in the earlier years that I—they will bear me out when I say that when the institution was trying to make a place for itself in the agricultural system of the Province of Ontario, we did have more or less unworthy boys who came here and made life a burden to everybody in sight, some of those boys had no agricultural instincts whatever, and when later they found themselves on a good farm and surrounded with good farm conditions they were quite at a loss. At any rate by comparison with those days I am pleased to say to you at the present time that a large percentage of the student body come to us very largely on their own initiative, and what is more to their credit in many instances at their own expense. I want to relate an incident which is not on my programme to-night, but I cannot think of a better way of illustrating to our ex-students what I mean by worthy boys. When I came here in charge of the institution five years ago I found in the hands of the College President a sum of money, which had been left as a bequest to the Agricultural College in the will of our late lamented friend, Mr. W. H. Massey. After Mr. Hart Massey had left provision in his will for the building of our own Massey Hall and Library, his worthy son, Mr. W. H. Massey set aside certain shares of stock in the Massey Harris Co., the annual dividends for which were to be given at the discretion of the President to certain worthy students in attendance at the O.A.C. There was no string tied to it in any way. It was simply placed in the hand of the President, and he was instructed to give it to whom he saw fit. It occurred to me it would be somewhat different to anything I had had to do up to that time to begin to spend some one else's money. So I conceived the idea that all I had to do was to go through the residence and select some boys who needed the money, and hand it to them. Much to my surprise, ladies and gentlemen, after a personal canvass with the resident master, finding out just exactly all we could quietly about their financial condition, who were those who had earned money to come here or were borrowing money from banks, or were running short of funds, or were proposing to stop their courses until they had earned more, we picked out twenty boys who stood well in their classes and quietly led up to the subject as best we could. I asked each of the young men in turn if he would not under the circumstances accept $50 in cash, and every one refused. I didn't think there were twenty boys in America that would refuse a $50 bill under the conditions that it was offered. I know that at the time when I was going through the College, that it would have been a god-send to me. But every one of these boys, twenty in all, gave me a good reason; every one of those boys stood up and said, "No. Mr. Creelman, I need the money, but I can make my own way, and I prefer to do it." Then I was non-plussed. However, we hit upon this scheme. I wrote a letter and put it upon the bulletin board. It read something like this:

To Students of the Ontario Argicultural College, Guelph:

There has been placed in my hands by the executors of the will of the late W. E. H. Massey a small sum of money, to assist certain worthy students in completing their College Courses.

I know there are many students who feel that they should not be any longer dependent upon their parents for College expenses; many whose parents cannot really

afford to keep them longer at College and do justice to the other members of the faculty; and there are also many who are paying their own way entirely while at this Institution. Under any of these circumstances, I am sure there are boys who would prefer to borrow the money for at least the last year or two of their College work than to be further dependent upon their home folks. To this end I have been able to make arrangements whereby any student who has shown an appreciation of his College Course may borrow from this fund now in my possession sufficient funds each year as will materially assist him in the payment of all expenses, this to be loaned to the student on his own personal note and absolutely without interest, the amount to be paid back at the convenience of said student.

I should be glad if any student wishing to take advantage of this offer would meet me privately at any time and talk over his affairs, with a view to profiting by this generosity on the part of the late W. E. H. Massey.

I am pleased to say to you that under these conditions, I have 164 boys now on the list. I make this comparison, and I think it is to the credit of the boys from the farms of Ontario who have thought the thing out for themselves, that while they are not going to take charity from anybody, they have business sense enough about them to know if they can borrow that money without interest it is good business, it is doing well for themselves, and yet they are not under obligation to anybody for having helped them through their College course except to that extent.

At the present time we have in the student body young men from each of the nine Provinces of the Dominion and from ten States of the American Union, and in addition we have students from the Argentine, Belgium, Cape Breton, East Indies, England, German, Holland, Ireland, India, Japan, Jamaica, Mexico, New Zealand, Scotland, South Africa, Spain and from Wales. So that the institution, besides attending to the wants of the regular patrons who come to use from year to year in this Province of Ontario, we are privileged, and I say it advisedly, we are privileged to have with us young men from these foreign countries who come here with ideas of their own, who come here with customs foreign to ours, but who come here representing countries of great worth in themselves, and by mixing with our young men from the farms of this Province give to our young men something which I quite feel that you ex-students in particular, who had the privilege of associating with young men from foreign countries when you were here, will appreciate. We learn from their manners and customs, things which we would probably not have an opportunity to see during the rest of our lives. I pay tribute to the young men from foreign countries, and say to the ex-students I am always pleased to have them come to us from year to year.

I have just two things more to say. We are met with the criticism in later years, from time to time, that we are educating in our upper years a class of young men who were good practical farmers' sons when they came to us, but we are now educating them away from the farm. I want to say, that is probably correct, and I believe perfectly right. I shall explain what I mean. When I say to you that the work of our first two years is, as most of you boys know, thoroughly practical; that in it and through it we believe from thirty-five years experience of able men on this faculty, turning over what is best in curricula throughout the United States and throughout the world, they have boiled it down to a very satisfactory course of study for the average young man who comes to us with a practical knowledge of agriculture, but without much knowledge of good methods; and so we devote a great deal of our attention and energy in all our departments to these young men for the first two years, and I am pleased to say that at the end of that time the young men have very largely got what they came here to

get. They have a better knowledge of English; they can write well, they can express themselves on paper, they have had a certain amount of experience in public speaking, they have been living on a good farm of 550 acres for two years, they have been meeting practical men of the faculty, they have been rubbing up against one another from different parts of the Province, and at the end of two years they are prepared to go back home and take up the burdens their fathers are prepared to lay down, or divide with them those labors, if he is not yet prepared to retire on his own account. The great majority of our boys do that; more than 50 per cent. each year of our entire student-body return to the farm. This year, for instance, of our class of 90 in the second year we expect there would not be more than 40 who will return to us, and 50 will remain on the farms at home, though when I make that statement I have not the record of examinations to go by. Now, then, of the minority, those who are left, those that can be spared from home, those who by virtue of the fact that since leaving home younger brothers have come along, or those, who, by virtue of the fact that the father who thought he would retire but now feels he is as young as ever, and so makes it possible for the son to continue at College, and this other class who left the farm deliberately, but who yet believe in the science and practice of agriculture as practised in the Province of Ontario, and combined with the science as taught at the O.A.C. desire to keep in touch, and keep directly in line with the profession of agriculture during the rest of their lives, but they have no farm to go back to—this is the class of men we are criticised for over-educating or educating away from the farm.

That leads me to the second thought. Criticism was more or less justified on this ground alone, that, when these men got through, had taken their degree and stepped out from the walls of the institution, that there was nothing but positions in the United States to attract them, and that they were leaving this country after this country had educated them, and were going away to swell the ranks of Canadian boys who had already gone to the other side of the line; and there was some cause for that criticism. But at the present time the Dominion Government in their several agricultural branches, Live Stock, Good Seeds, Experimental Farms and all other branches in connection with that great Department presided over by the Hon. Sidney Fisher, are offering splendid salaries to many of our men. The Ontario Department of Agriculture and the Agricultural Departments of all the other provinces, the new Colleges at Truro, Winnipeg and Ste. Anne de Bellevue, the Agricultural Press from Sussex, N.B., to Victoria, B.C., all such institutions and organizations are looking to us for men. What would the thousand and one side lines, as it were, of the profession of agriculture that require business and scientific training combined—what would they have done in the Dominion of Canada if we had not been able to provide them with these men?

Then, again, a new movement has been set on foot. Two years ago some of us had the opportunity of putting our heads together and developing a scheme whereby individual counties might be given a graduate from this College, who would settle down there and become the representative of the O.A.C. and of the Department of Agriculture. I believe as I believe anything to-night, that that is the greatest movement that has been started in agricultural educational work anywhere in the world. Agricultural Colleges have, up to this time, been trying to do a scientific agricultural work by taking less that 1 per cent. of the farmers' sons in the state or province, and,

after giving them a certain kind of instruction, have sent them out to leaven the whole lump. We are just touching the edge of it; and while the wheat crop in England still keeps up an average of 30 bushels per acre, the Province of Ontario has an average of less than 22 and the United States of America an average of only 12. A new country, and yet we have let our land degenerate to that extent and think that one Agricultural College in the Province can bring it back. Now that has been our mistake, and we are just trying to remedy it in this way. There are farmers within ten miles of the City of Guelph, who, if you drive out and hitch your horse in front of their gate, and ask them what the O.A.C. has done for them, will tell you "Nothing." They may be right or not. The chances are they are wrong. It may be Institutes or short course, it may be directly or indirectly through the education of some of their neighbors, or by bulletins or reports, they have gotten some information which has helped them in their business; but it may be the other way, and we certainly are not doing very much for such fellows. And why not? Simply because the farmer as he works upon his farm, is not the kind of man who puts himself in communication by correspondence with anybody else in his world. He sometimes even neglects to write to his own sons and daughters when they go away from home. I know farmers will bring me letters on the June excursions that they have written to me two or three months ago, and have carried it in their pocket all that time. The point I am getting at is this, that if there was a representative of the College, and the Department of Agriculture in the county town, who had driven out frequently to that man's farm, who had an office where the farmer could drop in, and instead of writing letters he could ask questions, and bring in while the weeds are yet fresh, samples for identification, samples that they intended some day to wrap up and send to the Agricultural College for identification, but which they didn't do, a place where free information was to be had at first hand and when wanted, there is no estimating the good that might be done. I say, the farmer, we must recognize, is not a writing individual, and often not a reading individual, but a thinking individual, a man who, the rural preacher will tell you, can pull his sermon all to pieces the next morning, a man who reads little, but thinks a great deal. That kind of a man is the kind of a man who can only be reached by personal contact. And these young men, in the county towns in eight of our counties, are already finding themselves so much taken up with that work that an assistant had to be given in some instances, a stenographer in another, and now they are applying for permanent assistance the year round.

How far reaching is such work going to be? Cannot you see that if a graduate of this College who had a good practical farm training before he came here, has spent four years here, and gone back to his own or some other county where be comes in contact with men who will take his hand and ask questions and talk freely with him, and who may say to him, "We are glad to see you, but the Agricultural College cannot help us,"—cannot you see how the whole country would be helped, and how the difference between the average and the possible crop would soon close up? I bring you this message to-night as ex-students, and to say to you that not only are these young men representing worthily your Alma Mater, but if the present Government will see its way clear to extend the work, there will soon be an outlet at home for brain work, as well as for the brawn of the young men who come to us from time to time from the farms of the Province of Ontario.

FORTIETH ANNUAL REPORT

OF THE

Fruit Growers' Association

OF

Ontario

1908

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1909

WARWICK, BRO'S & RUTTER, Limited, Printers,
TORONTO.

To the Honourable JOHN MORISON GIBSON, K.C., LL.D., etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the honour to present the Fortieth Annual Report of the Fruit Growers' Association of Ontario.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

DEPARTMENT OF AGRICULTURE,
TORONTO, 1909.

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Fruit Growers' Association of Ontario.

OFFICERS FOR 1909:

President ..... E. D. SMITH, Winona.
Vice-President ..... JAS. E. JOHNSON, Simcoe
Secretary-Treasurer ..... P. W. HODGETTS, Parliament Buildings, Toronto.

DIRECTORS:

Division No. 1.—R. B. WHYTE, Ottawa.
" 2.—HAROLD JONES, Maitland.
" 3.—F. S. WALLBRIDGE, Belleville.
" 4.—W. H. GIBSON, Newcastle.
" 5.—R. W. GRIERSON, Oshawa.
" 6.—A. W. PEART, Burlington.
" 7.—E. D. SMITH, Winona.
" 8.—G. A. ROBERTSON, St. Catharines.
" 9.—J. E. JOHNSON, Simcoe.
" 10.—D. JOHNSON, Forest.
" 11.—F. METCALF, Blyth.
" 12.—C. W. GURNEY, Paris.
" 13.—C. L. STEPHENS, Orillia.

Ontario Agricultural College: Prof. H. L. HUTT, Guelph.

Honorary Directors: THOS. BEALL, Lindsay; A. M. SMITH, St. Catharines; W. T. MACOUN, Ottawa.

Auditor: J. M. DUFF, Guelph.

REPRESENTATIVES TO FAIR BOARDS AND CONVENTIONS:

London: D. JOHNSON, Forest; C. W. GURNEY, Paris.

Ottawa: R. B. WHYTE, Ottawa; HAROLD JONES, Maitland.

Toronto: W. H. BUNTING, St. Catharines; P. W. HODGETTS, Toronto.

Ontario Horticultural Exhibition: W. H. BUNTING, St. Catharines; D. JOHNSON, Forest; E. LICK, Oshawa; P. W. HODGETTS, Toronto.

COMMITTEES:

Executive: President, Vice-President and Secretary, with A. W. PEART, Burlington, and R. W. GRIERSON, Oshawa.

Transportation: W. H. BUNTING, St. Catharines; J. L. HAMILTON, Clarkson; R. W. GRIERSON, Oshawa; E. D. SMITH, Winona; R. J. GRAHAM, Belleville; WM. RANDALL, Grimsby; J. L. HILBORN, Leamington; J. E. JOHNSON, Simcoe, and the Secretary.

Co-operation: JAS. E. JOHNSON, Simcoe; ELMER LICK, Oshawa; ROBT. THOMPSON, St. Catharines; C. L. STEPHENS, Orillia; A. E. SHERRINGTON, Walkerton, and D. JOHNSON, Forest.

New Fruits: Prof. H. L. HUTT, Guelph; W. T. MACOUN, Ottawa; J. W. CROW, Guelph, and H. S. PEART, Jordan Harbor.

Historical: A. MCNEILL, Ottawa; L. WOOLVERTON, Grimsby; HAROLD JONES, Maitland; W. T. MACOUN, Ottawa; W. DEMPSEY, Trenton; A. M. SMITH, Pt. Dalhousie.

Pomological Society: President, Vice-President and Secretary, with A. W. PEART, Burlington; R. B. WHYTE, Ottawa; G. A. ROBERTSON, St. Catharines, and H. L. HUTT, Guelph.

CONSTITUTION AND BY-LAWS.

Preamble.

The objects of the Fruit Growers' Association of Ontario shall be the advancement of the science and art of horticulture in all its branches.

(*a*) By holding an Annual Convention for the consideration of questions relating thereto.

(*b*) By co-operating in every possible way with district and local fruit growers' associations and horticultural societies hereinafter mentioned.

(*c*) By collecting, arranging and disseminating useful information.

(*d*) By co-operating with the Ontario Department of Agriculture in all matters pertaining to the advancement of horticulture.

(*e*) By holding an annual exhibition of fruit and other horticultural products and awarding premiums in connection with the same.

(*f*) And by such other means as may from time to time seem desirable.

Name.

1. This Association shall be called the Fruit Growers' Association of Ontario, and hereafter in this Constitution shall be referred to as the Ontario Association.

Membership.

2. Any person interested in horticulture may become a member by payment of one dollar per annum in advance to the general secretary, or by paying the necessary fee to the secretary of any district or local association in affiliation with the Ontario Association. A single payment of $10.00 to the general secretary shall constitute a member for life.

3. Members of the Ontario Association in good standing shall be entitled to receive regularly the official organ of the Association, a copy of the Annual Report, such other literature as may be sent out by the Association from time to time and any other privileges that may be provided or arranged for by the Association.

4. The Association financial year shall end on the 31st of December.

Annual Meeting.

5. The Annual Meeting shall be held at such time and place as may be designated by the Ontario Association.

Officers.

6. A President, Vice-President, Secretary-Treasurer and Directors only shall be the duly qualified officers of the Ontario Association.

7. The Directors shall be elected by ballot at the morning session of the last day of the Annual Meeting, and shall be thirteen in number, representing the thirteen Horticultural Divisions as set forth in Schedule A of this Constitution. The newly elected Board of Directors shall not take office till the second Tuesday in January of the year following, when the report of the retiring Executive and the Treasurer shall be received. No Director shall hold office for more than three consecutive years. Retiring Directors shall, however, be eligible for re-election at the end of one year.

8. The newly elected Directors shall at their first meeting appoint from among their number a President and a Vice-President, and also from among themselves or otherwise, a Secretary-Treasurer.

9. The President, Vice-President, Secretary-Treasurer and two other members appointed by the Directors shall constitute the Executive Committee of the Ontario Association.

Duties of Officers.

10. It shall be the duty of the President to preside at all meetings of the Ontario Association, decide all questions of order, and make any suggestions he may deem necessary in the interests of the Association. He shall be, *ex-officio*, a member of all committees appointed.

11. In the absence of the President, the powers and duties of his office shall devolve upon the Vice-President.

12. It shall be the duty of the Secretary-Treasurer to attend all meetings of the Ontario Association, the officers and the Executive, and keep correct minutes of the same; conduct all correspondence and issue all press and other reports; prepare the report of the Executive Committee for the Annual Meeting; forward the list of representatives to the Secretaries of Fair Associations, also prepare for publication the Annual Report. As Treasurer, he shall receive and account for all moneys belonging to the Association, pay such bills and accounts as have been approved by the Executive. He shall have the power of Managing Director acting under the control and with the approval of the Executive.

13. By virtue of his office he shall be a member of each committee appointed.

14. Before entering upon the duties of his office, he shall enter into a bond, with security when required, which shall be approved of by the Directors.

15. The accounts of the Ontario Association shall be audited by an expert auditor or accountant appointed by the Executive Committee, and approved by the Minister of Agriculture for Ontario.

16. At each Annual Meeting, the retiring executive officers shall present a full report of their proceedings to the Ontario Association. A detailed statement of the receipts and expenditures for the previous year, and of assets and liabilities, a list of members and such information on matters of special interest to this Association as the officers may have been able to obtain, shall be sent to the Minister of Agriculture for Ontario within forty days after the holding of such Annual Meeting.

17. The Executive Committee shall carry into effect the plan of work decided upon by the officers, and shall arrange the details of the same.

18. The officers, or the members of the Executive, or of any Committee may conduct by correspondence, the duties assigned to said officers, Executive or Committee, by the Constitution and By-laws, or by the Association, when such a course is deemed advisable by said officers, Executive or Committee.

19. In case a vacancy occurs in the officers or directorate, the Executive Committee may fill said vacancy forthwith.

Committees.

20. The Association may appoint such committees from time to time as may be deemed expedient, and the first person named thereon shall be declared chairman of each committee.

21.—(*a*) The actual and reasonable expenses of officers and members of committees when attending meetings in the interests of the Association shall be defrayed out of the funds of the Association.

(*b*) The railway fare only of the Directors in attending the Annual Meeting shall be paid by the Ontario Association.

Notice of Meeting.

22.—(*a*) At least two weeks' notice shall be given of each annual and general meeting, naming time and place of meeting. Notice may be given through the public press and by circular letter mailed to each member.

(*b*) An officers' meeting shall be called by mailing at least ten days before date of meeting to each officer, a notice of meeting as above provided.

(*c*) Similar notice shall be given to each member of the Executive before the Executive meeting is held.

(*d*) An Executive meeting may be held on shorter notice, provided each officer is otherwise notified and consents thereto.

Quorum.

23.—(*a*) Not less than ten members shall be a quorum to transact business for the Association; not less than five members shall be a quorum at an officers' meeting; and not less than three members shall be a quorum at an Executive meeting.

(*b*) Any member of the Directorate or Executive not present at a meeting, if he sends his views in writing, shall be considered as present.

Affiliated Associations.

24. Fruit growers in any section of Ontario may form a local Association when it has a membership of ten or over, upon the payment to the Treasurer of the Ontario Association of $5.00 for the first twenty-five members or fraction thereof above nine, and twenty-five cents per member for every additional member, which payment shall entitle the members to all the privileges and advantages of membership in the Ontario Association.

25. It shall be the duty of the officers and directors of the Ontario Association to encourage the formation of such local Associations.

26. Fruit growers who are members of two or more local Associations shall be accepted as members of the Ontario Association from that affiliated Association only which is the first to forward the membership fee to the Secretary-Treasurer of the Ontario Association.

27. Such affiliated Associations may appoint one delegate to the Annual Meeting of the Ontario Association for the first twenty-five members or fraction thereof, and an additional delegate for every twenty-five members or major portion thereof above the first twenty-five. The actual railway fare of said delegate in attending the Annual Meeting shall be paid by the Ontario Association.

Change of Constitution.

28. The constitution and by-laws may be amended by a majority of members present at an Annual Meeting or a special meeting called for the purpose of considering the same, and of which two weeks' notice shall be given.

Schedule A.—Horticultural Divisions.

1. Counties of Renfrew, Lanark, Carleton, Russell and Prescott.
2. Counties of Glengarry, Stormont, Dundas, Grenville, Leeds and Frontenac.
3. Counties of Lennox and Addington, Hastings and Prince Edward.
4. Counties of Northumberland, Durham, Peterboro' and Victoria.
5. Counties of Ontario and York.
6. Counties of Peel and Halton.
7. County of Wentworth.
8. County of Lincoln.
9. Counties of Welland, Haldimand, Norfolk and Elgin.
10. Counties of Kent, Essex and Lambton.
11. Counties of Middlesex, Huron and Bruce.
12. Counties of Brant, Oxford, Perth, Waterloo, Wellington and Dufferin.
13. Counties of Grey, Simcoe, Muskoka, Parry Sound, Nipissing, Algoma and Manitoulin.

Fruit Growers' Association of Ontario.

ANNUAL MEETING.

The forty-ninth annual meeting of the Fruit Growers' Association of Ontario was held in British Welcome League Hall, Toronto, on the 10th and 11th of November, 1908.

REPORT OF EXECUTIVE FOR 1908.

MEMBERSHIP. Your Executive beg to report that the membership in the Association has increased to a considerable extent during the year. The total number was 718, of which 632 came in from affiliated societies, as follows:—

Oshawa F.G.A., 60 members; Kingsville F.G.A., 27 members; Norfolk F.G.A., 152 members; Chatham F.G.A., 27 members; Burlington F.G.A., 40 members; Dunnville F.G.A., 41 members; Niagara Pen. F.G.A., 100 members; Arkona F.G.A., 18 members; St. Catharines Cold Storage and Forwarding Co., 103 members; Forest F.G.A., 23 members; Clarkson F.G.A., 41 members. Total, 632.

By Divisions this was as follows:

Division 1— 3.	Division 8—204.
Division 2— 4.	Division 9—200.
Division 3— 5.	Division 10—101.
Division 4— 7.	Division 11— 8.
Division 5—69.	Division 12— 14.
Division 6—84.	Division 13— 10.
Division 7— 4.	

Eight members living in B.C., Quebec, etc.

COMMITTEES. Your committees have been active during the year, and considerable was accomplished through their efforts. The committee appointed at the annual meeting in 1907 to look after the question of improving the market in Toronto, was able to induce the Grand Trunk Railway to put a new roof on the old market and generally to so improve it as to do temporarily for the purpose for which it was intended. Now that the Railway Commission has definitely settled the water front problem in Toronto by ordering the construction of a viaduct, there will be more chance of our getting this question settled than there was a year ago.

CO-OPERATIVE COMMITTEE. The co-operative committee during the year issued a special circular giving the names of the various associations in the Province, with the kinds of fruit that they packed, and the estimated crop for 1908. This was widely circulated, especially in the west. This committee also issued in the spring a circular giving price lists for spraying materials, pumps, hose, etc.

Transportation Committee. The transportation committee has been working quietly at the express rates and other matters in connection with the transportation of fruit by express, and expect at the first favorable opportunity to make an appeal to the Railway Commission. As the Commission is now considering this matter, it is likely that something will have to be done in the near future.

Horticultural Exhibition. This Exhibition is growing steadily in all mattters connected with it. In 1906 there was a deficit of $600; in 1907, $400, while in 1908 this was reduced to something like $275. The arrears the past year were made up by paying 85 per cent. of the prizes. This is not likely to assist the show, especially among fruit growers, and we think that the arrears of 15 per cent. should be paid by our Association.

Another matter in connection with the Exhibition which requires attention is that of the scheme for county prizes. This was started four years ago, and for the first two years the scheme seemed to be quite successful in some of the counties, while in others there was practically no competition. The last year Huron County enlarged on the former plan and made a special exhibit of the various fruits raised in the county. This was very successful, and drew considerable attention. In 1908 Norfolk County followed the same plan, but improved wonderfully on it, with the result that their exhibit was larger and better than all of the other counties combined. The exhibits from other counties have been, with a few exceptions, getting poorer year by year, despite the utmost endeavors to bring the scheme to the attention of the fruit growers in the respective counties. For instance, this year, the number of parties making entries in the individual counties were as follows:—Brant, 2; Halton, 5; Huron, 6; Lambton, 0; Leeds and Grenville, 6; Lincoln, 3; Northumberland and Durham, 5; Ontario, 6; Prince Edward, 2; Stormont, Dundas and Glengarry, 5; Victoria, 6; York, 7; Oxford, 5.

You will note that from Lambton there were no entries whatever, and the amount voted by the county was returned to the Treasurer intact. If it were possible to induce one-half of the number of counties who have hitherto taken part in this prize scheme to put up exhibits on the same plan as that of Norfolk, this year, we would have a very much larger display.

In connection with this Exhibition, the committee appointed at these meetings to represent our association should be authorized to go carefully over the prize list, cutting out such sections as do not make a sufficient display for the money offered. The committee should also endeavor to get as many specials as possible for the fruit section. Your Executive have already received an offer from Mr. Ruddick, of Ottawa, to give $10 for a special prize for a single apple of any one standard variety.

American Pomological Society. Owing to the length of the programme at the annual meeting, the matter of the entertainment of the delegates to the above meeting was not discussed. This matter will have to be definitely decided at this meeting. It has been suggested that a special committee of this association should be appointed to look after this work. We have already received the suggestions of Prof. Craig, and have on our Board of Directors, two members of this Society. We would suggest that this Association should offer some special prizes at the Niagara District Horticultural Exhibition, which will be held at the time of the Pomological meeting.

Legislation. It was suggested at the November meeting of our Association that legislation should be asked for or added to in respect to the codling moth and little peach. As this matter requires some care in the preparation of the same, and has to be brought to the attention of the Department of Agriculture, we would suggest that a special committee be appointed for this purpose. This same committee should also bring to the attention of the Department the proposed legislation in respect to nursery control.

Spraying. In connection with the work of the Executive last year, there was sent out a small pamphlet on the spraying of orchards for the codling moth. This proved to be very acceptable, and the methods outlined therein were tried by a considerable number of growers. We would suggest that this work be continued, and that every effort be made to bring before the fruit growers of the Province the necessity for, and value of spraying, in connection with the fight against the codling moth.

Annual Meeting. The annual meeting, held in the British Welcome League Hall, proved to be one of the best that has been held for a long time. A large number of representatives from the various associations throughout the Province were in attendance, while the speakers who were brought in from outside proved to be of great service through their addresses. A number of matters of importance were discussed, including legislation respecting the control of the codling moth and a disease of peaches known as little peach. A satisfactory change was made in the constitution in reference to the length of service of directors, which should definitely settle the difficulty which arose the present year.

Fiftieth Anniversary of the Association. The first meeting of this Association was held in January, 1858, and this year is therefore the fiftieth anniversary of the organization of the Association. We would call this to the attention of the Directors, and would suggest that in addition to the meeting of the Pomological Society at St. Catharines, some sort of special celebration should be held at the time of the show and annual meeting in November. An effort should be made to get together for our programme the very best speakers in horticulture to be found on the continent. Extra prizes might also be offered by this association at the show, so as to bring out a very large display of our best fruit. There should also be some sort of re-union of the old officers and members of the association.

Treasurer's Report. The Treasurer's statement shows a balance on hand of $1,690.63. This is the largest amount that we have ever been able to report, but your Executive has tried to be as economical during the year as possible, so as to have plenty on hand for the entertainment of the Pomological Society and the celebration of our fiftieth anniversary. The Treasurer's statement is as follows:—

TREASURER'S REPORT, 1908.

Receipts.			*Expenditures.*		
Balance on hand		$1,074 07	Show:		
Members' fees		215 75	Cash for prizes	$451 35	
Show:			Refunds fruit sold	433 80	
Sale of fruit	$984 60		Labor	67 00	
Entry fees	109 70		Transportation	80 25	
		1,094 30	Office expenses	129 72	
County Council grants		50 00	Judges' expenses	30 75	
Legislative grant		1,700 00			$1,192 87
Interest		39 28	Periodicals for members		377 55
Incidentals		9 50	Hort. Pub. Co., 5th and 6th calls on stock		200 00
			Annual meeting		270 20
			Committees		212 30
			Postage		31 25
			Audit		6 75
			Printing		135 55
			Incidentals		65 80
			Balance on hand		1,690 63
		$4,182 90			$4,182 90

TREASURER'S REPORT, 1908.—*Concluded.*

Show: Cash for prizes	$451 35	
Refunds for fruit sold, 1907.—R. J. Graham, $16.25; Frank Dempsey, $12.65; Chatham F. G. A., $4.85; W. H. Bunting, $7.00	40 75	
Refunds for fruit sold, 1908.—F. S. Wallbridge, $4.00; D. Whyte, $10.50; N. A. Brown, $4.00; W. McGregor, $2.00; R. C. Fowler, $4.00; W. G. Watson, $2.00; W. C. Oughtred, $8.00; A. A. Armstrong, $6.00; Brown Bros., $29.00; W. C. Parker, $48.00;; Norfolk F. G. A., $103.00; Oshawa F. G. A., $49.00; Chatham F. G. A., $26.00; A. D. Harkness, $7.00; T. G. Bunting, $12.00; J. B. Guthrie, $51.00; C. L. Stephens, $14.00; Mrs. Delworth, $2.40; R. Thompson, $9.15; C. Harris, $2.00	393 05	
Labor.—W. F. Kydd, $30.00; R. A. Boddy, $3.00; B. Hoy, $4.00; H. K. Revell, $8.00; H. N. Knauss, $4.00; R. C. Pickard, $4.00; Wm. L. Bengough, $4.00; M. S. Middleton, $10.00	67 00	
Transportation.—Canadian Express Co., $33.52; Dominion Express Co., $16.11; G. T. R., freight, $21.52; A. S. Brandon, cartage, $2.25; D. Muir, cartage, $1.75; Wm. McIlroy, $4.25; Grand Trunk, freight, 65c.; Toronto and York Radial Co., 20c.	80 25	
Office Expenses.—W. T. Reid, $125.00; Bell Telephone Co., 40c.; Incidentals, $4.32	129 72	
Judges' Expenses.—E. M. Ferguson, $3.15; J. Hamilton, $2.15; P. J. Carey, $5.00; M. Pettit, $5.15; J. C. Smith, $5.15; W. F. W. Fisher, $5.15; H. W. Dawson, $5.00	30 75	
		$1,192 87
Horticulturist: Periodicals, $377.55; stock, $200.00		577 55
Annual Meeting: Reporting meeting, 1908, $50.00; Wm. Clements, 1907, travelling expenses, $1.60; 1908, M. B. Waite, $45.00; W. Lochhead, $29.00; T. A. Lampman, $6.85; A. Lawrie, $4.40; T. Eaton, decorating, $15.00; British Welcome League Hall, $20.00; Chas. Potter, $7.00; A. W. Peart, $7.80; G. A. Robertson, $2.50; C. L. Stephens, $2.75; A. D. Harkness, $9.45; Jas. E. Johnson, $2.85; D. Johnson, $4.75; R. W. Grierson, $1.45; J. R. Hancock, $2.40; L. H. Weaver, $2.40; R. R. Waddell, $15.40; W. H. Stainton, $1.15; C. W. Gurney, $2.25; Caretaker British Welcome League Hall, $2.00; L. C. Palmer, $6.40; J. Gilbertson, $2.90; W. F. Olds, $2.90; W. C. McCalla, $2.55; R. Thompson, $2.80; W. E. A. Peer, $1.10; H. St. C. Fisher, $3.30; J. H. Broderick, $2.55; E. Boughner, $2.70; A. Onslow, $3.15; Jas. Symington, $2.75; H. T. Foster, $1.10		270 20
Committees: E. Lick, $10.80; A. W. Peart, $7.60; Jas. E. Johnson, $13.60; R. J. Graham, $15.15; C. L. Stephens, $9.60; H. St. C. Fisher, $12.90; R. B. Whyte, $18.85; A. D. Harkness, $16.90; F. S. Wallbridge, $8.90; H. Jones, $15.05; Wm. Rickard, $6.70; R. W. Grierson, $2.75; C. W. Gurney, $5.10; G. A. Robertson, $6.50; H. L. Hutt, $3.25; A. E. Sherrington, $7.65; W. H. Bunting, $43.70; C. L. Stephens, $6.00		212 30
Postage: Mrs. Hubertus, $30.00; postage from cash, $1.25		31 25
Audit: J. M. Duff		6 75
Printing: Methodist Book Room, letterheads and envelopes, $23.25; spraying circular, $21.75; ballots, post cards, co-operative circular, programmes, stationery, $47.50; placards, $1.25; Might Directories, circular and county prizes, $6.80; Brown Bros., entry and judges' books, $35.00		135 55
Incidentals: Dominion of Canada Guarantee Co., treasurer's bond, $10.00; A. McNeill, livery, expenses of meeting, $5.10; Bank of Commerce, $1.90; P. W. Hodgetts, express, etc., $9.45; Dominion Express Co., $1.10; Toronto Stamp and Stencil Co., $2.50; Canada Stamp and Stencil Co., 75c.; Advertising, *Weekly Fruit Grower*, $5.00; *Canadian Horticulturist*, $18.00; Horticultural Exhibition Prize list, $12.00		65 80

PRESIDENT'S ADDRESS.

By A. W. Peart, Burlington.

As President of the Ontario Fruit Growers' Association I wish to extend to you a cordial welcome to our Convention, and hope that the conclusions reached by your discussions may be of a character to advance the best interests of the fruit industry. I also wish to thank the members for the honor done me in the election to the chief executive office of the Association.

In the death of Dr. Fletcher, Entomologist and Botanist of the Experimental Farm, Ottawa, the fruit growers of Ontario have lost a genial, earnest and sympathetic friend and co-worker, and the country a large and able and distinguished scientist.

I congratulate you upon your increased membership—an increase during the past year of 206. This means greater influence and power for good. The work of the executive during the past year need only be referred to by me very briefly, as a full statement will appear in the annual report of the association. Suffice it to say that your executive were very strongly impressed that something further should be done to check the ravages of the Codling Moth. With that end in view, hundred of circulars were issued to fruit growers. These contained formulas used by successful sprayers and urged the necessity of giving the directions a fair trial. I am pleased to state that many availed themselves of this information with satisfactory results, and that the idea is gaining ground that the moth can be controlled by proper spraying.

Last winter the Department of Agriculture of this Province organized a series of Fruit Institutes, which were held at different points. These meetings were a new educational departure along practical lines. The programmes were skilfully arranged, the best available fruit experts were secured as speakers, and the results were highly satisfactory and much appreciated.

I need only refer to the excellent exhibit of fruits at the Horticultural Exhibition, and trust that all present will take advantage of this splendid opportunity for practical as well as academical education.

During the year, the Department of Agriculture has made large exhibits of fruit at Winnipeg, the Anglo-Franco Exposition, in the G. T. Railway Building, and also at the Canadian National Exhibition. A very large exhibit of apples is now on the way to the Royal Horticultural Exhibition in London, England. It is also the intention to send the latter exhibit to the smaller towns as well. These exhibits will advertise our capabilities and the excellence of our fruits.

The various committees appointed by the Association will report in due course.

In some respects, the record of the fruit industry for 1908 has been an exceptional one. Bloom was early and profuse. The rainfall until the latter part of August was unusually heavy. This was succeeded by a searching drought which remains practically unbroken even now, November 10th. Subsequent to August, apples and pears grew but very little. With the dry period came fine, sunny weather which hastened maturity. The conditions were particularly favorable to the Codling Moth. Probably its work was never before so severely felt in unsprayed and uncared for orchards. In some places some varieties were almost completely riddled with worm holes. On the other hand, the same conditions appeared to be rather unfavorable to fungous growth. Apples and pears were fairly free of the spot. A not-

able exception occurred in the Greening which developed a whitish mould adjacent to the skin, making it almost worthless save for evaporating.

Apples were a light crop; plums, cherries and small fruits an average, while pears, peaches and grapes were heavy. Prices generally ruled low, in part, due to the financial depression and consequent lack of ability to purchase. As fruit growers, it becomes us to adapt ourselves to the depressed condition, and curtail our expenditures to that minimum commensurate with the economic management of our business.

In glancing over the progress of the fruit industry in this Province during the last seventeen years, we are led to the conclusion that its growth has not been of a fitful, sporadic character, but has been based on one sure foundation. From 1891 to 1901, the gross quantity of fruit increased about 100 per cent. During the past seven years the advance has been about 2 per cent. per annum. The expansion of the industry necessarily depends upon profitable markets. Taking the world markets of to-day and the near future, it would appear as if there were room for a large expansion along the apple line in those districts of the Province naturally suited for growing good staple varieties. Our apple area is practically unlimited, and our northerly latitude and abundant sunshine give Ontario fruit that distinctive quality which makes it noted in foreign markets.

Fruit growing in this province is in an experimental stage. Many pressing problems confront us, such as the most suitable soil for a given kind of fruit; the sort of fruit best adapted to a certain soil and climate; variations in soil for different varieties of the same kind; care of orchards and plantations in their manifold details; the food elements required by different fruits; various methods of pruning; the destruction of injurious insects and fungi; co-operation, or reaping the maximum amount of profit; grading, packing and marketing. Few, if any, of these questions have reached their final solution, and the conclusions formed to-day are subject to revision as our knowledge increases.

Still, on several of these problems have been thrown search-lights which enabled us to make a material advance, so that we have reason to feel hopeful for the future. The standing of the industry in time to come will be an evolution from its past, and will in no small degree depend upon the character of the men engaged in it during its formative stages.

As fruit growers, our ideals should be based upon integrity, intelligence and industry, linked together by the all potent force of unity. Upon these pillars, the moral, the mental and the physical—rest the whole fabric of successful fruit growing.

COMMITTEES.

The following committees were appointed:

Nominations: Messrs. E. D. Smith, D. Johnson, Elmer Lick, Robert Thompson.

Resolutions: Messrs. M. Pettit, Wm. Armstrong, C. L. Stephens, Geo. Robertson.

REPORT ON NEW FRUITS.

By W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

A few weeks after the last annual meeting of the Ontario Fruit Growers' Association the writer prepared a circular letter which was sent to a large number of newspapers and periodicals in Canada. The circular read as follows:—

"During the past three hundred years many varieties of fruits have originated in Canada, some of which are of great merit. The Dominion and Provincial Governments through their official publications, have recorded a large number of those originated, but up to the present time no complete list of Canadian fruits has been published. In view of the fact that many new varieties are being originated every year, it seems desirable, before the task becomes too great, to prepare as complete a list as possible, so that in future all that it will be necessary to do, will be to add to it the new ones.

The Horticulturist of the Central Experimental Farm requests, therefore, that the secretaries and members of fruit growers' associations, horticultural societies, and farmers' institutes, assist in preparing this list by sending to him the names of any seedling or cross-bred fruits of Canadian origin which they think should be recorded. It is especially desired to get information regarding local or unnamed seedlings of merit. Please send, if possible, the originator's name, the date of origin, the name of the place where originated, a description of the fruit, and any other information regarding it. Any or all of these particulars would be appreciated. Even if the name and address only of the originator were sent it would enable us to correspond with him and get further information.

The Horticulturist will be glad to examine and report on the merits of any new fruits which may be sent to him. Letters and mail parcels under five pounds in weight may be sent free of postage.

(Signed) W. T. Macoun, Horticulturist."

In response to this request, quite a number of varieties of fruit were sent in for examination, both during last winter and during the past summer. A few of these were quite promising, and descriptions of them follow:—

Apples.

Seedling from A. E. Bellman, Bowmanville, Ontario. Fruit medium size; roundish, slightly oblong; cavity deep, medium width; stem short, slender; basin medium depth; calyx open; color, yellow, almost entirely covered with deep crimson; dots moderately numerous, yellow; distinct; skin moderately thick, moderately tender; flesh white, with traces of red, tender, juicy; core medium; subacid, pleasant flavor; quality good to very good; season evidently through January.

This is a handsome apple of good quality of the Fameuse type. The specimens sent came from a warm room. Quite promising. Will be very promising if a better keeper than McIntosh. Said to be in bearing four or five years. January 8th, 1908.

Seedling from Wm. Chambers, Carnarvon, Ontario. Fruit large; oblate; cavity deep, open; stem short, stout; basin deep, open; slightly wrinkled; calyx partly open; color yellow well splashed and streaked with bright, purplish red; dots obscure; skin moderately thick, tender; flesh dull white, crisp, tender; core medium; subacid, sprightly, pleasant flavor; quality good; season apparently through January, or later. Thought to be equal to Duchess in hardiness, and said to seldom have an off year in bearing. Mr. Chambers got scions from Thomas C. Robson, Allsaw, Ont. (now of Alberta). Has been growing 14 years and fruiting 8 years. Five barrels in 1907. A very promising seedling if as hardy as is said. Resembles a Duchess in outward appearance, but is larger. Flesh and flavor somewhat like Gravenstein. January 8th, 1908.

Golden Crown. Above medium size; roundish, almost oblong, somewhat flattened on ends, slightly angular; cavity medium depth and width; stem short, stout; basin deep, open, slightly wrinkled; calyx open; color yellow with traces of pinkish red on sunny side; dots obscure; skin moderately thick, tender; flesh white, tender, breaking, juicy; core medium; subacid, pleasant flavor; quality good; season evidently December and later. Said to be a seedling of a large imported apple. Seed planted about 1880. Apple grown by Adonijah Marks, Clifton, P.E.I. Said to bear better than Yellow Transparent. The original tree is growing on a hill exposed to the Northwest and is said to be "as hardy as an oak." Resembles Grimes Golden very much. December 23rd, 1907.

Henry White. Medium size; form oblate to roundish; cavity medium depth, rather open; stem broken, probably slender; basin medium depth and width, smooth; calyx open; color pale yellow washed with reddish pink on sunny side; dots obscure; skin moderately thick, tough; flesh white, tender, juicy; core medium to small; subacid, pleasant, good flavor; quality good to very good; season evidently mid to late winter. A promising apple from R. Schwerdtfeyer, Morrisburg, Ontario, somewhat resembling Princess Louise in appearance and flesh and flavor. February 2nd, 1908.

Jacob Red. Medium size; form roundish, flattened a little at ends, slightly angular; cavity medium depth and width, russeted; stem short, stout; basin medium depth and width, smooth; calyx open; color pale yellow washed and splashed with crimson; dots moderately numerous, grey, distinct; skin moderately thick, tender; flesh yellowish, firm, juicy; core medium; subacid, pleasant flavor; quality good; season evidently mid to late winter, A promising winter apple of attractive apearance. February 2nd, 1908. Specimens received from R. Schwerdtfeger, Morrisburg, Ontario.

Plums.

Joseph. Seedling from Joseph Rowley, Sr., Cummings Bridge Ontario. Form oval, flattened; very large; cavity shallow, medium width; suture a distinct line, not depressed; apex rounded, almost pointed; color yellow, more or less washed and mottled with attractive red; dots numerous, yellow, distinct, bloom medium; skin moderately thick, moderately tender; flesh yellow, juicy; stone above medium size, oval, almost free; flavor sweet, rich, good, quality very good for one of this type. An American plum of the largest size. Attractive in appearance and one of the best in quality. Very promising. Came up in Mr. Rowley's garden in 1904. Bore in 1907 one plum. In 1908 2 dozen plums: Tree measures 4½ inches around base 1908. No American plum trees near, but may have grown from a pit of one of these plums accidentally dropped there. September 24th, 1908.

Seedling plum from Wm. Judge, Orangeville, Ontario. Form, goose egg shape; medium to above in size, 2 by 1⅝ inches; cavity shallow, medium width; suture a distinct line, not depressed; apex rounded; color yellow tinged with green; dots numerous, small, indistinct; pale yellow; bloom whitish; skin moderately thick, tough; flesh greenish yellow, juicy; stone medium size, long, cling; sweet, rich flavor, quality good. A plum somewhat between Yellow Egg and Coe's Golden Drop in shape. Promising. September 21st, 1908.

Seedling plum from Wm. Judge, Orangeville, Ontario. Form oval, slightly flattened at ends. Size medium, about size of Lombard, 1½ by 1 5-9 inches; cavity medium depth and width; suture a distinct line, very slightly

depressed; apex slightly indented; color dark purplish violet; dots yellow, numerous, prominent; bluish bloom; skin thin but tough; flesh yellowish, moderately juicy, rather firm; stone medium size, roundish, cling; sweet, rich flavor. Quality good. Much like Lombard in outward appearance, but darker in color and is of better flavor than Lombard. A promising plum if better than Lombard. Domestica group. September 21st, 1908.

Plum seedling from Jas. Tarry, Tarry's, B.C. Form oval, slightly longer on one side than the other; szie above medium to large, 1½ by 2 inches; cavity medium depth and width; stem medium length, slender; suture a distinct line, slightly depressed; apex flattened, slightly indented; color dark purple almost black with a blue bloom; dots few, grey, indistinct; blue bloom medium to heavy; skin thin, tough; flesh greenish yellow, juicy; stone above medium size, oval, cling; sweet, good flavor; quality good. A promising plum; not very rich, but of good quality and of good size. Domestica group. October 7th, 1908.

Cherries.

Cherry seedling from Emil Anstad, Trail, B.C. Fruit, large; heart shaped; cavity medium depth and width; stem long, 1¾ to 2 inches, slender; apex indented; suture an indistinct line; color dark red or blackish showing brighter red through; dots obscure; skin moderately thick, tender; flesh dull red, meaty, juicy; stone medium size, cling; sweet, pleasant flavor; quality good; season evidently late July. Seed planted in 1898 by A. P. Anstad, Trail, B.C. A good cherry; evidently a Bigarreau. July 29th, 1908.

In addition to the above it is desirable to mention the receipt of 17 new seedling currants from Mr. C. L. Stephens, Orillia, Ontario, and 10 new seedling gooseberries from Mr. P. Barrett, Truro, N.S. Among these were some which if they prove sufficiently productive may take their place among commercial varieties later on.

We should like to draw the attention of Canadian nurserymen to the importance of having a larger list of the Americana plums. There is an immense tract of country through central and eastern Ontario, Quebec, and New Brunswick where the European sorts do not succeed and where the American plums can be grown successfully. Some of the most promising sorts not now found in the catalogues of Canadian nurserymen are: Bixby, Mankato, Admiral Schley, Brackett, and Oren.

We should like to take this opportunity of again saying something of the work we are endeavoring to do at the Central Experimental Farm in originating new varieties of fruits, and apples especially.

While the trees which have resulted from hand pollination, and of which there are quite a number now at Ottawa, are approaching bearing age we have had the advantage of having a large number of seedlings fruit which were from apples crossed naturally in the orchard, seedlings from such apples as McIntosh, Fameuse, Northern Spy, Wealthy, Swayzie Pomme Grise, Salome, Golden Russet, Gano, and others. There are about 2,000 of these in the orchard, of which 434 have fruited. This year 411 seedling trees were in bearing, of which 249 were fruiting for the first time. New cross-bred and seedling trees will be planted from year to year.

Some very promising apples have already been obtained, and it is expected that among them will be at least a few which will prove better than those already on the market. Following are the names which have been given. Des-

criptions of these varieties will be found in the annual reports of the Experimental Farms:

Sonora: Langford Beauty seedling.
Congo: Lawver seedling.
Thurso: Northern Spy seedling.
Bruno: Scott Winter seedling.
Ottawa: Swayzie seedling.
Navan: Swayzie seedling.
Severn: Swayzie seedling.
Radnor: Swayzie seedling.
Galetta: Wealthy seedling.
Mendel: Wealthy seedling.
Clive: Wealthy seedling.
Medford: Wealthy seedling.
Crusoe: Wealthy seedling.
Adonis: Wealthy seedling.
Noel: Wealthy seedling.
Pinto: Wealthy seedling.
Linton: Winter St. Lawrence seedling.
Melba: McIntosh seedling.

Eighteen in all. These are being grafted with the idea of learning how they do as grafted trees. In addition to the work being carried on by the Horticultural Division, there is the work being done by Dr. Saunders in originating apples suitable for the Northwest, with which this Association is familiar.

New plums, pears, grapes, and strawberries are also being originated at the Central Experimental Farm, but in smaller numbers than apples.

Several promising new black currants originated by Dr. Saunders have recently been introduced.

Mr. Cockburn thought that the growers should turn their attention to the American plum rather than to European varieties for the north.

Mr. Dempsey: In regard to plums in the east, we have experimented with Wolfe, Hawkeye and Stoddart, among American varieties, but found them so astringent as to be of little use. I also planted Weaver, Forest City and Cheney, obtained from the Renfrew Nurseries. I would not give them room on my farm. The Weaver very much resembles the old fashioned Niagara. A plum called Raines has been growing on Montreal Island for a number of years. I have four trees coming into bearing. The flesh is firm and sweet, of fairly good flavor. Even in 1903 and 1904 the tree showed no signs of winter killing, whereas the Lombard was winter killed.

REPORT OF COMMITTEE ON NURSERY CONTROL.

Robert Thompson, St. Catharines, Chairman.

Your committee respectfully submits the following draft of an Act to Regulate the Sale of Nursery Stock:

AN ACT TO REGULATE THE SALE OF NURSERY STOCK.

1. This Act may be cited as the "Nursery Control Act."

2. In this Act the words "nursery stock" shall mean any fruit-bearing trees, vines, shrubs or plants, or any part of such fruit-bearing trees, vines, shrubs or plants.

3. No person, firm or corporation shall engage or continue in the business of growing and selling nursery stock, or act as selling agent, solicitor or otherwise within the Province or shall import nursery stock into the Province for sale without first having obtained a license to carry on such business in the Province, as in this Act provided.

4. All nursery stock sold within the Province shall be labelled with the true name of the varieties, and if imported, so labelled.

5. No person, firm or corporation, or agent of such person, firm or corporation, engaged in the sale of nursery stock, shall substitute other varieties for those ordered without having first obtained the written consent of the purchaser.

6. Any nurseryman or agent of any nurseryman shall be liable for damages in the common courts of the Province within twelve months after the trees come into bearing, where fraud can be shown in the substitution of varieties or sale of stock untrue to name.

7. No contract shall be made by any nurseryman or agent of any nurseryman containing provisions contrary to any sections of this Act.

8. The Department of Agriculture for Ontario shall publish yearly a complete list of the persons, firms and corporations engaged in any way in the nursery business, such list to state clearly whether the parties are *bona fide* growers of stock or agents only.

9. Licenses shall be issued from the Department of Agriculture for Ontario on application, and shall be good for one year from date of issue. Such licenses may be suspended or cancelled by the Department of Agriculture upon evidence satisfactory to the Department that the holder of the license has sold nursery stock contrary to any sections of this Act.

10. Any person neglecting to carry out the provisions of this Act shall upon summary conviction be liable to a fine of not less than $5.00, and not more than $20.00, together with costs, and in default of payment thereof shall be subject to imprisonment in the common gaol for a period of not less than days, and not more than days.

Mr. WALBRIDGE: With reference to section 6, how are you going to prove fraud on the part of a nurseryman in the substitution of varieties?

Mr. MCNEILL: The measure will not be worth the paper it is written on if the prosecutor must prove fraud.

Mr. THOMPSON: Our committee was a joint one of nurserymen and fruit growers. While our report may not cover all the points we fruit growers wish to cover, I would ask that you allow it to go through. If it is found that any clause requires amending, it can be dealt with later, when we see how it works out.

The PRESIDENT: You will remember that at the last meeting of this Association, two committee were appointed, one of fruit growers and one of nurserymen. These men have had the matter under consideration during the past year and have agreed upon the report they have presented. It is a new departure and may be found to be defective in some respects. I may say, however, that the spirit of both the committees has been conciliatory and magnanimous, and this report has been mutually agreed upon as a result.

On motion of Mr. R. THOMPSON, seconded by Mr. GEO. ROBERTSON, the report was declared adopted.

REPORT OF COMMITTEE ON CO-OPERATION.

JAMES E. JOHNSON, SIMCOE, CHAIRMAN.

The co-operative committee met in Guelph, on February 6th, and again in Toronto, on Feruary 20th. The spring work consisted particularly in getting together of a circular giving a full list of firms handling such supplies as spraying materials, pumps, hose, chemicals, etc., together with wholesale prices for the same. All of the Associations in the Province were sent copies of this circular and also instructions in reference to the purchasing of any of the goods.

In connection with the spraying regulations carried out by the Department of Agriculture, your committee assisted Mr. Hodgetts in drawing up a set of rules for this work which we believed would be in advance of those in 1907. The grants were to be made payable on the basis both of acreage sprayed and the efficiency of the spraying.

Your committee also investigated various systems of bookkeeping for co-operative associations, looking particularly into that of Copeland-Chatterson Co., which was explained to this Association at their last annual meet-

ing. It was found that the cost of these business systems as used in ordinary commercial work was too great to allow of their being used generally by the Associations.

During the summer a pamphlet was issued giving the names of co-operative shipping associations in the Province and their secretaries and the probable output for 1908. This pamphlet was circulated largely at the Winnipeg Exposition and to various fruit dealers and other parties applying for the same in Ontario. The pamphlet contained also information in reference to the general work of these associations.

A recommendation was further made to the Department of Agriculture that an instructor in barrel packing be appointed to visit the various associations. This recommendation was adopted, and Mr. Backus, of St. Catharines, looked after this work.

REPORT OF THE COMMITTEE ON TRANSPORTATION.

W. H. Bunting, St. Catharines, Chairman.

So far as this year's work is concerned, your committee has nothing very definite to report. Circumstances have been of such a character that we have been unable to carry out the program outlined. In the first place, the Railway Commission became somewhat disorganized owing to the death of the chairman. It was sometime before a new chairman was appointed. Since then the busy season has been on us and we have been unable to arrange to present our own case. Then, too, owing to the exceptional prices of fruit in 1907, we were not able to bring the same arguments to bear as we might have done the year previous, or could do for the present year.

Your committee has been gradually assembling data, and, during the coming year, will be in a better position than ever to present the facts as to the very great handicap under which we are laboring, more particularly in regard to express rates.

One of the questions brought up a year ago was the necessity for better accommodation for fruit at the shipping stations. I understand that since that time the railway companies have provided at a number of points better facilities for the reception and handling of fruit. And then request was made that shippers should be accorded the privilege of sorting up cars at divisional points on payment of a stop-over fee. This has finally been granted, and shippers are now able to assemble cars at such points and sort them up in accordance with the demand.

The greatest hardship felt during the past year was in connection with the distribution of our goods to the smaller places. Owing to the heavy crop and comparatively low prices that prevailed, the question of express charges became a very serious item. I think this Association should urge the committee for the ensuing year to press very strongly for relief in connection with the exorbitant charges in that connection. The majority of us in St. Catharines were forced to abandon the express business and ship entirely in car load lots to the larger markets, which is detrimental to the smaller consuming points.

E. D. Smith, Winona: With regard to express rates, it was found when the season opened that the express companies had raised their rates by charging the weight of a basket of fruit at 17 lbs., six baskets making 102 lbs., instead of 100 lbs as formerly. This in the aggregate meant a very large amount of money to the growers of the Niagara district. It was a long struggle before we succeeded in getting the original rate restored. These

companies should not be allowed to change their rates as they see fit without first obtaining the sanction of the commission. Because of the high express rates, particularly to distant points, our growers are losing a large share of the markets for Canadian fruit. If we are to compete with Californian tender fruits and get possession of the northwest market, we must either get a lower express rate or else higher tariff. Without one or the other of these things, we cannot meet Californian peaches and plums in that market. Californian peaches were laid down in that market at a dollar, and even as low as 75c. a case in some instances, a case being larger than the ordinary peach basket. When we have to pay an express rate of $2.40 per hundred, car load lots, it is absurd for us to think of competing with this. In other fruits, which we can ship by freight, we can compete.

Wm. Armstrong, Queenston: There are a number of fruit growers who invest capital in the forcing of vegetables during the winter months, and with reasonable transportation, they could do so with benefit to themselves and to the consumer. I made a shipment of six baskets last winter, and as the carrying charges appeared to be exorbitant, I wrote to the commission house to know if they were correct. They replied that the shipment weighed 100 lbs., and that the charges were 70 cents to Hamilton and 30 cents from Hamilton to Toronto, making a charge of $1.00 for a distance of forty miles.

A Member: I think we should give credit where it is due. Last year I voiced the complaint of the growers as to the treatment received from the Grand Trunk in connection with the express business. As a result a great many of our grievances have been swept away. The service is not perfect yet, but a vast improvement on what it was before. Among other things, they gave us a car for our late fruit and vegetables, which was placed on our siding three times a week, and we were allowed to load into it. We paid freight charges on it, and thus secured what was practically express service at a very low rate. This, I think, could be obtained by some of the other associations. This year we have had a new difficulty to face, namely, the charge for delivering the fruit in the city of Toronto made by the local commission merchants. The growers in our Association have felt this very keenly.

Mr. Onslow, Niagara-on-the-Lake: This year after the boats stopped, the express companies put up the rate from 30 to 60 cents.

Mr. Bunting: It is only within the past few months that the express companies were placed under the jurisdiction of the Railway Commission. No doubt the same rule will hold that now applies to railways namely, that the schedule of rates cannot be changed without consultation with the commission.

As to winter and summer rates, the rates should be the same all the year round, and should not be raised as soon as the transportation by boats ceases. I assume that this was the reason of the change to which Mr. Onslow refers.

The Chairman: Every fruit grower who is being imposed upon in regard to rates, should acquaint the committee with the facts, and thus strengthen their hands.

REPORT OF COMMITTEE ON FRUIT MARKET IN TORONTO.

H. St. C. Fisher, Queenston, Chairman.

For the past few years the fruit growers of Ontario have been shipping their fruit to Toronto under very unfavorable market conditions until this year when the facilities for handling it have been greatly improved.

One year ago your convention assembled, took the matter up with the City Council, and in consequence a committee of fruit growers was appointed to confer with the Council to see if something could be done for them in this respect, whereupon, the City Council appointed a committee to meet the Fruit Growers' committee and a committee representing the Commission men of the city. It was also decided to call in the transportation companies interested, and deal with the matter in a business-like way.

The committees met at the City Hall from time to time to discuss ways and means for procuring for the city a much-needed fruit market. I have much pleasure in stating that the meetings were of a very profitable nature in that the whole matter was sifted down in such a way that we have now a greatly improved market. The Grand Trunk Railway deserve much credit for the way in which they have improved the facilities in Toronto. It seems that the City Council are inclined to wait until the water front question is settled before they undertake to build a fruit market to which all the transportation companies will have access on equal terms, and I would like to suggest right here that this Convention appoint and retain a representative market committee until such has been accomplished.

For the information of those who are not familiar with what has been done by the Grand Trunk Railway to better the conditions that existed one year ago, I might say that the old Great Western Station at the foot of Scott St. (now known as the Scott St. Fruit Market) where nearly all the fruit that has come into this city for several years past has been handled by the commission men, has been renovated in such a way that we have now probably four times the floor space that we had a year ago; a new floor has been put down, the roof has been repaired, electric lights have been installed and the whole interior has been whitewashed, so that, all things considered, we have a much better place to which we can ship our fruit than we have ever had before, so our efforts along this line have met with a fair measure of success. I understand that it cost the G.T.R. something like $4,000 to make the necessary repairs, and thanks are due them that we have had even a shelter for our fruit for some years past.

I am not one of the kind who is content with the conditions that even now exist. I believe the fruit growing industry is second to none in this country, and we should not rest until we have built in this city one of the finest fruit market buildings on this continent. Toronto is worthy of such a market, and I make this statement without fear of contradiction, that Toronto has the best market for choice fruits in Canada, and probably on this continent. This is readily explained. We all know that the population of this great city is comprised largely of genuine Canadians, who love things Canadian, and who are willing and able to pay a high price for a first-class article put up in first-class shape so as not to excite suspicion, for none of us would like to buy some of the packages of fruit that are sent to this market by some fruit growers who are not present here to-day. I would urge upon every fruit grower in this country to aim toward a high standard of perfection in every detail, quality before quantity, every package of fruit *honestly* packed, your name

on the package, and I can assure you the price will take care of itself. All these things go toward bettering our market conditions.

The St. Lawrence Market, where all the farmers' products are handled in this city, is a market that the farmers should be proud of and I believe they are proud of it. Why should the Fruit Growers take a back seat? We do not have to, so I think we should extend our efforts until we get exactly what we want in the shape of a fruit market. I am sure the City Council are willing to do their part in this very important matter.

In submitting this report on behalf of your committee, I do so feeling that we have done our duty, and have only to say that if this Convention sees fit to appoint a standing Fruit Market Committee, it should do its best during the coming years to show the City Council that if they wish to hold the fruit trade, they must as soon as possible build a suitable market to which all the transportation companies will have access on equal terms.

Before leaving this matter with you, I would like to say a few words in reference to the transportation companies, speaking only of course, from experience. The Canadian Express Co., working in conjunction with the Michigan Central and Grand Trunk Railways has, the past season done much toward landing the fruit shipped from Queenston station in the market without delay and in a good marketable condition. They are to be congratulated on having a superintendent here in Toronto who is thoroughly familiar with the conditions as they exist with us all along the line, and we thank him for procuring for us better shipping facilities this year than we have ever had before, and he can if he will, do much more for us in the future than he has in the past which would certainly guarantee more business for them.

The Dominion Express Co., working in conjunction with the Niagara Navigation Co., did their part at our end of the line, but when the fruit landed in Toronto, there was absolutely no decent place on the wharf for the company's men to handle it, so that it had to be loaded from the fruit trucks to waggons or drays, carted across the railway tracks to the Fruit Market and then unloaded into the market. The same is true of the fruit that is shipped from St. Catharines and vicinity to Toronto, and we as fruit growers know that the oftener our fruit is handled before the market is reached the less it is worth. So all these things go to show that the fruit market conditions in the City of Toronto can yet be greatly improved upon.

Mr. Bunting: In recommending the adoption of this report, I wish to say that I think this Association owes its thanks to the Mayor and the Property Commissioner and members of the Council who have interested themselves in the matter, as it was largely through their efforts that the railway company consented to make the improvements referred to.

REPORT OF COMMITTEE ON REVISION OF THE CONSTITUTION.

A. D. Harkness: This year a difficulty has arisen in regard to the clause in the constitution which provides that each year the four directors who have served longest on the board shall resign. This year there are three who would be retired on this account, but when it comes to the fourth, we find that there are three who have been on the board for the same length of time, and no way is provided for determining which of them shall make the fourth retiring director. To overcome this, the suggestion is made to follow the plan of electing school trustees, by grouping the thirteen districts into three divisions. Division No. 1 will elect its directors for one year; Division No. 2 for two

years; Division No. 3 for three years; after which the plan will be reversed, Division No. 1 electing its directors for three years, and so on. I beg to move the adoption of this system.

Robert Thompson, St. Catharines: The original idea of the framers of the present constitution was to introduce new blood on the directorate. I move in amendment that the plan originally proposed at the time the constitution was framed be adopted, namely, that a director shall not hold office for more than four years. That is to say, strike out the clause as it now stands, and substitute the words, "no director shall hold office for more than four years; directors to be eligible for re-election after one year's retirement."

Mr. Robertson, St. Catharines, seconded the resolution, but said he thought that three years would be better.

Mr. Thompson concurred in this, and changed his amendment accordingly. The amendment was then voted upon and declared carried.

THE COMMERCIAL SPRAYING OF APPLE ORCHARDS.

The Chairman: Up to the present there has been a great deal of scepticism in regard to the value of spraying for the Codling Moth. I have had some doubts on the subject, but this year I used the methods employed by the Simcoe and Forest Associations with very satisfactory results. It has been said that there are two broods in some districts, but I am convinced that the moths hatch out continuously through the season. To find out how long it took for the pupæ to mature, I banded a tree on Tuesday and removed the band the following Monday, and in that time the worm had gone through its transformation and only the shell was left.

Mr. Maxwell Smith, Burlington: My business is that of an apple buyer. My object has always been to try to buy the best apples by going into the sections where I knew the best apples were to be had. I have always been a keen observer of spraying. The first time it was brought to my attention was in 1889, when the Government was doing some spraying near Dutton, in Elgin County. I bought the two sprayed orchards, and obtained better fruit and fewer culls from those orchards than any I bought that fall. Since then, my observations have convinced me that the time has arrived in this country when fruit growers must spray if they expect to grow good fruit. There was a time when we could depend on good crops without spraying. The last year we had a uniformly good apple crop was in 1896. Since that time they have been gradually getting worse, until for the last two or three years it has been almost impossible to find any quantity of good apples. This is due chiefly to the Codling Moth. This is due partly to the carelessness of the farmers and partly to the foolishness of the apple buyers. These men start out in July and worry the farmers until they sell their apples. The farmer sells to the highest bidder, and after that he does not care whether the apples are good or not. I do not blame the farmer; I blame the buyer. There are in Ontario more irresponsible men in the business of apple buying than in any other business in this country. This last year, however, the Liverpool, London and Glasgow houses have shut down on these men to a large extent by limiting their capital. It will be a good thing if they shut down still further, as they will then buy fewer and better apples. This will make it an object to the farmer to grow better apples.

It has always seemed strange to me that a farmer will call in a veterinary surgeon and spend money to cure a sick cow, and yet he will allow pests to eat

up his orchard, which should be worth four or five hundred dollars to him. I believe that one acre of good apples, properly looked after, will produce as much as any other ten acres of the farm. A good apple orchard, one year with another, can be made to pay three or four hundred dollars with very little care.

In my section, the four great pests are San José Scale, Codling Moth, Oyster-Shell Bark-Louse, and fungus. The greatest of these by far, I consider to be the Codling Moth. My experience has led me to believe that it is the easiest pest of the lot to handle. I quite agree with what Mr. Peart has said. I have heard many men say that if you catch the first brood you have it practically coralled for the season. Others say there are two broods; others that there are three broods. My observation is that the Codling Moth hatches as regularly as the day comes. No doubt it hatches in greater quantities in the early part of the season, but I believe that it hatches regularly throughout the season. I banded the trees in my own orchard and took off the bands every ten days or two weeks. I have killed as high as sixty in a band, and every week right through the season until now, you will find them in the bands as in the first instance.

Q.—Do you advocate spraying in the fall after the leaves are off?

A.—Not for Codling Moth; the leaves and apples are off and they are not eating then. I listened to a lecture by Mr. Johnson, of Simcoe, with very great interest. I consider him to be a very practical man. He convinced me that he had obtained results from spraying. While I have always been an advocate of spraying, I never got so much technical knowledge of spraying as I did from his address. I had sprayed in a kind of a way, that is to say, I hired a man who did commercial spraying, allowed him to do it as he saw fit, and paid him what he asked; consequently, I did not get satisfactory results. After listening to Mr. Johnson, I determined to give it a thorough practical test for two sprayings and look after it myself. Mr. Johnson advocates three sprayings. I omitted the early spraying because of the condition of my land. The orchard referred to, I acquired in 1905. The first year I forwarded all the apples to the evaporator. In 1906, I packed of Ribston apples, 44 per cent. No. 1's, 35 per cent. No. 2's and 19 per cent. culls—I did not pack any No. 3's that year. In 1907, we packed 20 per cent. No. 1's, 24 per cent. No. 2's, and 37 per cent. No. 3's, and had 10 per cent. culls. This was the result from commercial spraying. In 1908, the year I sprayed thoroughly, we packed 80 per cent. No. 1's, 20 per cent. No. 2's, and there were not half a dozen barrels of apples that would not go into those classes. I may add that it was the finest car of Ribstons I ever packed—the most uniform, the best sized and best colored. Besides this, the fruit hung on the trees better, and the foliage stayed better. The purchaser said they were the best Ribstons he had ever seen.

Mr. Peart: I can bear Mr. Smith out in what he says about the fruit.

Mr. Smith: I am obliged to differ a little from Mr. Johnson in his theory of spraying. He advocates three sprayings, using an excess of lime and an excess of bluestone for the early sprayings for fungus; and then adds in the later spraying Paris green or white arsenic for insects. He gives two sprayings previous to blossoming, and states that a third spraying as the blossoms fall will coral the Codling Moth. With my Ribstons, which are an early variety, it practically did so. But with Spy, Baldwin, and Greening I had a lot of moth on September 1st, when the other apples were fit. I conclude therefore that to successfully handle the moth, a later spraying is necessary. A more powerful insecticide than Paris Green is necessary. I find Paris Green very irregular and uncertain, and there is always the danger

of burning the foliage with Paris Green. This year I went through New York State looking for good apples. There they use practically nothing but arsenate of lead. This sticks well even in the event of a slight rainstorm, and even later in the season, they had very few wormy apples. Next year I shall spray at least four times, probably five.

Q.—How will you distribute these sprayings?

A.—I would spray as Mr. Johnson recommends, the first time for fungus and scale before the buds open, while the tree is bare—that is, any time in the winter. I would spray a second time just as the buds were about to open; a third time when the blossoms are dropping and the calyx is quite open, so that the calyx can be filled with the spray mixture. The Codling Moth enters the apple at that time through the calyx. The worm enters the apple easily there, and if the calyx is full of poison, it will kill it. This will successfully handle the first brood, which is the largest.

Q.—Where does the second brood come from if you destroy the first?

A.—No matter how well you spray, you cannot destroy them all. I will spray the fourth time when the fruit is about the size of marbles. If the season is favorable to Codling Moth, I will spray even later. I shall use arsenate of lead.

Q.—Any danger of stinging the apple?

A.—It is absolutely harmless, whereas Paris Green is not.

Q.—What quantity will you use?

A.—About four pounds to a hundred gallons, I think.

Q.—Do you put the arsenate of lead in the water?

A.—Yes.

Q.—Do you use any lime?

A.—There is a difference of opinion as to the best fungicide. Bordeaux mixture is a fungicide, so is lime and sulphur. Certainly I would always use lime. Bordeaux mixture or lime and sulphur with the arsenate added. Another thing in its favor is that once dissolved it will remain in suspension and not settle.

Q.—Do you use the same formula for all the sprayings?

A.—You cannot use as strong a mixture of Bordeaux or lime and sulphur after the foliage is out.

Mr. Pattison, Grimsby: It makes a great deal of difference where you are as to the number of broods of the Codling Moth. Below the mountain it is very much worse than above, and probably much worse than with Mr. Johnson at Simcoe. I was there at apple picking time, and do not think that five per cent. of the apples was affected.

Mr. Smith: I think there is very little difference in this respect between the Niagara District and Halton, Wentworth, or Elgin. Yet Mr. Johnson relies on one spraying after the blossoms fall.

A.—That spraying would doubtless kill a large percentage of them.

Mr. D. Johnson, Forest: It is not necessary for me to enter into any lengthy argument to prove the necessity for spraying; it has already been demonstrated. A man may cultivate his orchard as much as is necessary, fertilize it as much as is necessary, and properly prune it, but if he does not spray his trees, I cannot see how he can be successful as a fruit grower. Evidence of this is everywhere apparent. Orchards that once brought forth beautiful fruit are to-day deserted because of the ravages of insect pests. The farmer may do all that is necessary, but if he does not spray, his work is of no avail. It is some fifteen years since I started to spray, and I did not like the work at all: I thought it the most detestable job that anyone could engage in. My father, who had read a great deal, was convinced there

was something in it, and kept us at it in spite of everything. The first few years we did our work as carelessly as we possibly could, because I had no faith in it. But by and by we began to see some results, and finally I developed into the crank I am now. By spraying we increased the production of our orchards by fifteen hundred or two thousand barrels a year of apples of the finest quality. You may say that this was due to additional care, but such was not the case. We cultivated just as well and fertilized just as well before as we do now. Our method is this: we use a gasoline power-sprayer with 175 pounds pressure; two lines of hose with bamboo extension rods, one of which is handled by the man on the platform fourteen or fifteen feet from the ground; the other by the man on the ground. Both men cover everything in sight and spray thoroughly. I have no confidence in spraying unless it is thoroughly done. The reason men do not get better results is because of haphazard methods. We use the regular Bordeaux formula— 4 lbs. of sulphate of copper, 4 to 6 lbs. of stone lime and 4 oz. of Paris Green, dissolved in 40 gallons of water.

The night before we commence the spraying we mix a stock solution by taking three barrels three parts full of water, and suspending in each a coarse sack containing sixteen pounds of sulphate of copper. In the morning this is dissolved. Then we take fresh lime and slake it very carefully, dilute it to milk of lime and stir it into the tank. Then fill the tank almost full of water, put in the Paris green in the form of a paste, add the copper solution and thoroughly agitate.

The first spraying is given before the leaves open, and we do not use Paris green in this application. The second spraying is just before the blossoms open, and the third just as soon as the blossom has fallen. The fourth application is two weeks later. The mixture and system has given wonderful results. I could cite many orchards that produced nothing but wormy, scabby fruit, which are to-day producing beautiful fruit as a result of this treatment. We have very little scab, and very little worm where the spraying is properly done.

I believe in spraying with the wind. If the wind is blowing from the north, we spray that side of the trees only, and when it changes, we spray the south side. Stop at least three times on each side of the tree, and spray everything in sight. You cannot get satisfactory results by stopping only once at a tree.

There is a good deal of difference of opinion as to nozzles. We read a good deal about fine mist-like spray. That may be all right for the small grower, but I am speaking to commercial growers, and for our purpose I believe in a nozzle that will send a spray out with force. We used the "Friend" last year, and it comes the closest to my ideal. I know there are some who disagree on this point, but I am speaking of the result of my experience.

We always leave certain check trees in the centre of our orchard to continually prove to ourselves the benefit of spraying—spraying one side of them only. We find almost every year that the sprayed side produces beautiful foliage and beautiful fruit, while the unsprayed side produces no fruit.

This spray can be applied with success not only to the apple, but to the pear for scab and to the plum. While we do not use as strong a mixture on the tender kinds, we get just as good results. Some years ago we had an orchard that was producing nice crops of plums. One year the rot set in and we lost practically the entire crop. Next year we sprayed, and while the season promised no better than the season before, we had a crop of about 2,000 bushels. Ever since that, we have sprayed the plums.

The question of the mixture used by Mr. J. E. Johnson, of Simcoe, came up for discussion. While we do not use exactly the same mixture, we always argue on this subject. We at Forest always use the regular Bordeaux formula. He uses another formula, and applies it only three times. This year we made a trial of his mixture on ten acres of orchard, spraying three times. The result was very satisfactory indeed, in fact I think we liked it better than our own, and next year I think we shall use it entirely.

James E. Johnson, Simcoe: Since I came to this meeting I have received several testimonials similar to the one voiced by the previous speaker in regard to our mixture. I know it is a difficult matter to get growers to spray. It is dirty work, and they will not take hold of it themselves, but leave a great deal of it to their help, and the help does not care for that kind of work. Before undertaking to spray, you should ascertain what insects and fungous diseases you are going to fight and then study how to control them. When you spray, spray thoroughly and at the right time. The time to spray is one of the greatest secrets of success. I know that in spraying for the codling moth a few days delay may ruin the whole crop. A good many have large orchards, and having only one spraying outfit, they cannot spray the whole orchard at the right time. You should not attempt to spray more than ten or twelve acres with a hand outfit. With a power sprayer, where you can run it satisfactorily, probably you can spray fifteen acres, although with our hand outfit we are able to put out six hundred to eight hundred gallons per day, and that is about as much as a power outfit can do. The outfit used by the Norfolk Association is on exhibition at the show now being held. It is simple and one man can do the pumping. The gasoline outfits at the present time are not always sure; that is the great objection to them. In spraying apples, I spray first for fungous diseases, and, second, for the bud moth, and third, for the codling moth. I refer to the county of Norfolk; other counties may have to spray for other insects and diseases. We have to add another spraying now for the Tussock moth. Last year was the first time we had any trouble with this pest. Two of our orchards were damaged 50 per cent by it. Last year was our first experience with this pest, so that I have not had much opportunity for studying it. It begins by eating the young foliage and follows the leaves right up. It also eats into the apple. Most of the apples will heal over and form a slight scab; others will show quite a disfigurement. Every grower in our section should spray next season for the Tussock moth. I have made a trip to New York State every year for twenty years. In many orchards this fall I saw them spraying for the Tussock moth. It is a pest that is going to be very hard to fight, in my opinion.

Q.—What is the proper time to spray for it?

A.—I should think about two or three weeks after the blossoms fall. Probably Professor Lochhead could give some idea of that.

Prof. Lochhead:—It hatches out of the egg mass sometime in May, varying in different localities—from the middle of May till the 15th of July. It is then a caterpillar and feeds on the leaves, and then is the proper time to spray for it.

Q.—Did you ever try picking the cocoons off in the winter?

Mr. Johnson: This is our first experience with it.

Mr. Tweddle: We spray for them about the 11th of June. The greater portion are hatched by that time with us, and we destroy them in that way.

Mr. JOHNSON: The formula of the spraying solution we are using is as follows: 250 imperial gallons of water, 1 lb. white arsenic, 3 lbs sal soda, 1 lb. Paris green. With the first spraying we use 20 lbs. of copper sulphate and 70 lbs. of stone lime. In regard to the lime, only the lumps should be used, avoiding the air-slacked lime. We prepare the arsenic by boiling it for 45 minutes with the sal soda. We buy the granulated vitriol (copper sulphate) and place it on a hopper made to fit over the manhole in the tank. We then pump 150 gallons of water through the hopper, which will dissolve the blue stone.

As to lime, we have a box that holds about 70 gallons. In this box we place 70 lbs. of lime and slake it, being careful not to burn it. Make it into milk of lime and then add it to the vitriol solution in the tank, having a man agitate thoroughly all the time the lime is being poured in. Also agitate while the arsenic and Paris green is being put in, and keep the mixture well stirred.

Q.—What is the object of Paris green and arsenic both?

A.—It is an additional precaution. I got the formula from New York State, and it gave such good results that I did not care to change it.

Q.—Do you use arsenic and Paris green with every spraying?

A.—No, only for the second and third.

Q.—What is the idea of boiling the white arsenic with the sal soda.

A.—It is not sufficiently soluble to dissolve in the water. (Arsenite of soda is formed.) Now, as to the codling moth, it is one of the hardest insects we have to fight. This year we tried to use one outfit on too much orchard. One of our orchards we sprayed as soon as the blossoms fell. When we came to the second orchard the weather was bad, and one thing and another delayed until a week passed before we got it sprayed. In this orchard 75 per cent. of the fruit was affected by the codling worm. In the orchard sprayed one week earlier, not two per cent. was affected. If a second spraying did any good for the codling moth, we should have got some good from the later spraying.

Mr. TWEDDLE: Do you agree with the statement that the codling moth nearly always goes in at the blossom end?

Mr. JOHNSON: Yes, that is correct.

Mr. TWEDDLE: Then you have a different one to what we have.

Mr. JOHNSON: I understand that you have a continuous brood; we do, too, unless we spray thoroughly, and get the calyx full of the mixture. I should like to know how many of the members have used our mixture. (About a dozen persons stood up).

Mr. GRIERSON, Oshawa: There are a number of others who have used practically the same mixture with more lime and no Paris green.

Q.—We use the mixture, but do not kill the second brood?

Mr. JOHNSON: Do you give a third spraying immediately the blossoms fall?

A.—Yes, I do.

Q.—Is it possible that our trees may be reinfested from neighboring unsprayed orchards?

Mr. JOHNSON: I do not think so—not that season; they might be the next season.

Q.—Don't you think it would answer to use white arsenic without Paris green? We did so this year and killed almost everything.

A.—It might do just as well.

Q.—Would it not do to use Paris green and no arsenic?

A.—It might, but if the Paris green happens to be bad, you are taking great chances.

Q.—Have you tried arsenate of lead?

A.—Yes, but only in a small way.

Q.—A good many claim that it is better than Paris green or white arsenic.

Q.—Do you consider that spraying later than the one given at the time the blossoms fall will kill any codling moth?

A.—How late?

Q.—This year the moth was active with us in September.

A.—You might kill a small percentage. I heard Prof. Powell, of New York, make this statement: "Whatever you do, kill all the first brood, and the second brood will take care of itself."

Q.—Don't you think it would be desirable to spray later than the blossom falling period, if not for the moth then for fungus?

A.—No doubt it would have a good effect on fungus diseases. This season, particularly, it would have been beneficial, as we have had nearly two seasons for fungus growth during the past season.

J. C. Harris, Ingersol: My system of spraying differs quite materially from the systems advocated by the gentlemen who have spoken. First, we have no scale in our district. During the last four seasons no one in our district sprayed till the 1st of June when the blosoms had about fallen. I sprayed about sixty acres. I go over the trees as quickly as possible when the blossom is half off. Then I turn round and go over them again as quickly as possible. About three weeks after this, we give a third application. I use practically the same mixture as Mr. Johnson. We have had just as good results spraying after the blossoms fall as spraying before they open. For ten years I have sprayed previous to blossoming. During the last four seasons I have sprayed only after blossoming and have had just as good results.

Mr. Caston, Craighurst: The oyster shell bark louse is very bad. I should like to ask whether the treatment for San Jose scale is equally effective for oyster shell bark louse. This pest does more damage in most parts than many people are aware of. I am thinking of using lime and sulphur, and would like to know what effect it has on oyster shell.

Mr. Johnson: We had this pest very bad in our section, but find that the excess of lime used in our Bordeaux mixture has killed it out almost completely. Three years ago my orchard was very bad, and now it is completely cleaned out.

A. N. Brown, Middleport, N. Y.: I will confine my remarks on commercial spraying to one sentence: Commercial orcharding depends entirely on commercial spraying. Now, as to oyster shell: I should recommend treatment at the time the brood is hatching. In Delaware, which is my home State, it hatches about the middle of June. At that time you can almost kill it with cold water. Mr. Johnson spoke of his formula killing it. It will do so effectively at that time, as it is then very delicate. They will all hatch in from twenty-four to thirty-six hours, and for some time they will hang around the shell as though too delicate to get away from it. The lime sulphur wash will destroy the oyster shell scale when the trees are dormant. When you spray for San Jose scale, if the mixture is properly prepared and properly applied, you destroy not only the San Jose but all these other scales. At the same time you have a fungicide just as valuable as Bordeaux for apple scab and apple fungus, the spores of which are carried over from the preceding season.

I must differ from some of the remarks of previous speakers. This spraying proposition has been my life study. In Western New York this year, the orchards that were sprayed only once for the codling moth were not contracted for by buyers until quite recently. One spraying did not control the second brood. Where you spray your trees properly at the time the calyx is open, you will probably get 90 per cent. of the codling moth, but you cannot control the moth on the outlying trees of your neighbor who has not sprayed properly, and consequently you have a second infestation.

The orchards that were sprayed three times in New York State were contracted for as rapidly as the buyers could contract for them at $2 and $2.25 a barrel. One of the largest buyers told me that they would not contract even at $1.50 a barrel for orchards that had not been sprayed three times, and that the difference was 40 per cent. between two and three sprayings for codling moth. We in Delaware have to spray three times; in California and in some of the Western States they have to spray five and six times.

I would recommend the use of arsenate of lead to the exclusion of everything else. If you have no law to compel the standardizing of Paris green, you do not know what you are getting. Much of the Paris green as sold in the States before the passing of the law was not worth the containers in which it was packed. We hope to secure the passage of a bill at the next session of Congress to compel the standardizing of all sorts of spraying material.

Arsenious oxide is the poisonous agent in Paris green; it washes off very easily. White arsenic or arsenite of soda is the cheapest form of arsenite, but it is also the most dangerous form. In arsenate of lead you have a combination in which there are no dangerous acids. It will go into suspension readily (none of these preparations go into solution—they are held in suspension.)

Q.—What formula do you use with arsenate of lead?

A.—Four pounds to the hundred gallons of Bordeaux mixture or to the water alone. You do not need to use lime with arsenate of lead properly prepared. As regards the tussock moth, if you control the codling moth you will control the tussock moth absolutely.

Prof. Lochhead, Macdonald Agricultural College, Quebec: In spite of what has been said about several broods of codling moth, there is only one brood as entomologists understand it. The codling moth comes out unevenly from its winter quarters. The first eggs hatch about July first with us. But the hatching is delayed in many instances, and the result is that there is a continuous escape of the adult fly from the pupa right through the season, which makes what is apparently a continuous succession of flies. The progression from egg to caterpillar, from caterpillar to chrysalis, and from chrysalis to moth takes place only once each season.

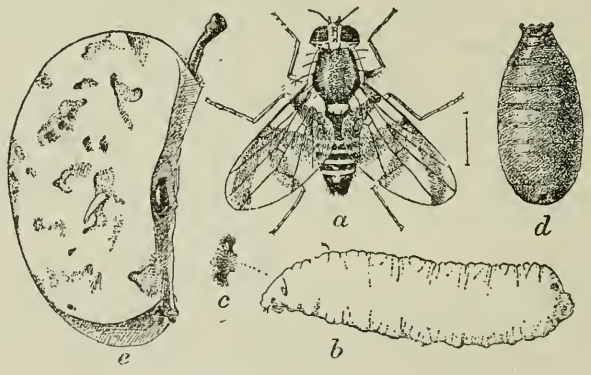
Prof. M. B. Waite, Pathologist, United States Department of Agriculture: Prof. Quaintance made the discovery that what is supposed to be the later brood of codling moth is in reality another insect altogether—the plum moth. The insect that gnaws into the side of the apple, making a hole that resembles that made by the codling worm, but not entering the apple, is not the larva of the codling moth but of the plum moth. This has given rise to a good deal of confusion.

THE APPLE MAGGOT, APPLE TREE CANKER, AND THE APPLE LEAF BLISTER-MITE.

By Professor Wm. Lochhead, Macdonald College, Quebec.

The Apple-Maggot.

The Apple-Maggot, often called the Railroad Worm, is a native of this continent, and had the hawthorn as its food-plant before the introduction of the apple. One would think that the insect would be wide-spread on account of the wide distribution of the host plant, but strange to say, it has not been observed from many parts of the continent where the haw is found. Prof. Quaintance, of Washington, is of the opinion, therefore, that its present distribution has been brought about by the dissemination of infested apples from infested localities. A peculiar characteristic of the habits of the apple-maggot is that its operations are quite local, and that it spreads from orchard to orchard somewhat slowly. This habit excites surprise when it is known that the adult is a two-winged fly which can



Apple maggot (*Rhagoletis pomonella*): *a*, Adult; *b*, larva or maggot; *c*, funnel of cephalic spiracle; *d*, puparium; *e*, portion of apple showing injury by maggots, *a*, *b* and *d*, enlarged; *c*, still more enlarged; *e*, reduced. (After Quaintance.)

aparently fly well. Quaintance records its occurrence in Illinois, New York, Connecticut, Massachusetts, Maine, Wisconsin, Michigan, Vermont, New Jersey, North Carolina, Ohio, Minnesota and Pennsylvania. I have observed it in Prince Edward County, and at Como and Ste. Anne's, Quebec, and Dr. Fletcher has seen it also at St. Hilaire, Que. It will be seen that it is peculiarly an insect of the Northern tier of States, and the adjacent portions of the Provinces of Quebec and Ontario.

Prof. Walsh, of Illinois, bred it from haws in Illinois in 1867, and described it in the *American Journal of Horticulture* for December, 1867.

There is but one brood or generation in a year. The adult flies make their appearance about July first, but they continue to appear throughout the summer, giving the impression that there are more than two broods. Eggs are therefore deposited in the apples from early summer to late fall. A female is capable of producing from 300 to 400 eggs during her life time, which may last a month or more. Maggots hatch from these eggs four or five days after deposition in the flesh of the apple and begin imme-

diately to burrow in the pulp. Characteristic channels are formed through the apple, which are detected by the brown pulp left by the maggot after rasping the pulp to extract the juices. The maggot dos not mature until the fruit is mature, which simply means that the early flies attack the early apples and the later appearing flies the late apples. It does not leave the apple to change to a pupa until the apple falls to the ground or is taken from the tree. When the apple falls the maggot bores a hole through the skin and buries itself just beneath the surface of the ground, or sometimes at the roots of grasses. When the fruit is packed in barrels or in storehouses the pupæ are found at the bottom. The pupæ remain as such until the following summer, when the adult flies emerge.

The eggs are light yellow in color and spindle-shaped. The maggots are footless, and are also of a yellowish white color. When full grown it is about one-third of an inch in length. The body is narrow at the head end, but broadens gradually to the tail end. The pupæ are pale yellow-brown, barrel-shaped bodies about one-fifth of an inch in length. The adults are two-winged flies, smaller than the common house flies. They are of a "general black color, with yellowish head and legs, greenish eyes and dark feet. In the male there are three, and in the female four white bands across the abdomen. Across the wings of both sexes are four black bands."

Preventive Measures. The best preventive measures for the control of insects are those that call into operation cultural methods, such as good cultivation, drainage, timely plowing, etc., etc., as opposed to artificial methods, such as spraying, etc. A thorough knowledge of the life-history of the insect is required in order to deal effectively with it. In the case of the apple-maggot spraying is of little avail, as the larvæ work within the fruit, the eggs are deposited within the skin, and the pupæ lie hidden beneath the surface of the ground. Cultural methods, therefore, are the only ones that can be adopted. There are two or three vulnerable points in its life-history in which it can be attacked successfully. The first is: the maggot leaves the fruit after it has fallen to the ground or has been packed. Prompt gathering and the destruction of all fallen apples before the maggots leave them is perhaps the best way to destroy the apple maggot. If this method were carried out carefully and co-operatively, there is reason to believe that the pest would cease to be troublesome. It is clear that if the wormy fruit is allowed to lie on the ground every facility is allowed the insect to increase.

It should not be a difficult matter to find ways and means of disposing of the fallen infested fruit. Hogs and cattle when allowed to feed in the orchard are effective agents of destruction of windfalls. When pasturing is impracticable for one reason or another the windfalls should be promptly collected and destroyed.

Another cultural method, which is possible and is worthy of trial, is the plowing and cultivation of the orchard for the destruction of the pupæ. As a result of some experiments by Professor Card of Rhode Island on the effect of plowing on the pupæ, it was concluded that while spring plowing had very little effect on the pupæ, frequent cultivation in the early summer resulted in their destruction. It would appear, therefore, that in those orchards where surface cultivation is practised until July first, danger from the apple worm is reduced to a minimum.

Another preventive measure is to attend carefully to the destruction of the refuse of barrels and storehouses in which apples have been stored.

The New York Apple Tree Canker.

From many sections of the country come alarming reports of the effects of canker on apple trees. An examination of some of the orchards reveals the presence of the New York Apple-tree Canker. The cause of this canker is the "Black Rot" fungus, which is commonly found on apples. Prof. Paddock of the New York Experiment Station, Geneva, demonstrated satisfactorily by inoculation experiments that the Black Rot fungus is the cause of the cankers so common on the branches of the trees. The first effect of the canker, after the infection occurs in the spring, is a discolored area of outer bark. These areas soon enlarge, and sometimes encircle the branches. The inner bark is killed, and there is noticeable a definite boundary to the diseased areas. After the disease has made considerable headway the bark loosens and peels off, exposing the bare wood. Of course when complete girdling occurs, the portion of the branch beyond the canker dies. Prof. Paddock believes that the fungus effects an entrance through wounds or cracks. It is very probable also that inoculation occurs very frequently through the agency of sucking insects, as I have frequently observed the infection to begin from punctures in the bark, which were probably made by sucking insects. Professors Parrott and Stewart, of Geneva, have very cleverly shown that the Snowy Tree-Cricket (*Œcanthus niveus*) may be the unconscious agent of the inoculation of twigs by canker.

New York Apple-tree Canker is found more frequently on the larger limbs of well-grown trees than on the smaller and younger limbs of young trees. Moreover, thrifty trees are more resistant than weak and neglected ones. On the bark killed by this canker spore bodies termed *pycnidia* are frequently observed in autumn and winter. The mycelium of germinating spores from these *pycnidia* cannot effect an entrance to the cambium through the living tissue, but can find an entrance through wounds. Paddock believes that in some cases the mycelium may live over winter in the bark, for he cannot otherwise account for the formation of the largest cankers.

Paddock recommends in the line of prevention of canker that trees should not be crowded, and that they be pruned so as to admit sunshine and air.

To sun-scald and sun-burn were previously ascribed such injuries to twigs. It is very likely, however, that the injuries due to sun-scald have been exaggerated, although it is undoubtedly true that trees suffer from this cause to some extent. The sun-scald areas are usually quite characteristic. They run longitudinally, and are usually found on the south and southwest sides of the limbs.

The treatment which has been recommended for the control of this canker is:

(1) To collect and destroy diseased fruit which usually accumulates in orchards on the trees. These, however, often contain the spores of the Black Rot fungus, by means of which the cankers are inoculated in the spring. The destruction of such diseased fruits will greatly diminish the liability of infection of the limbs;

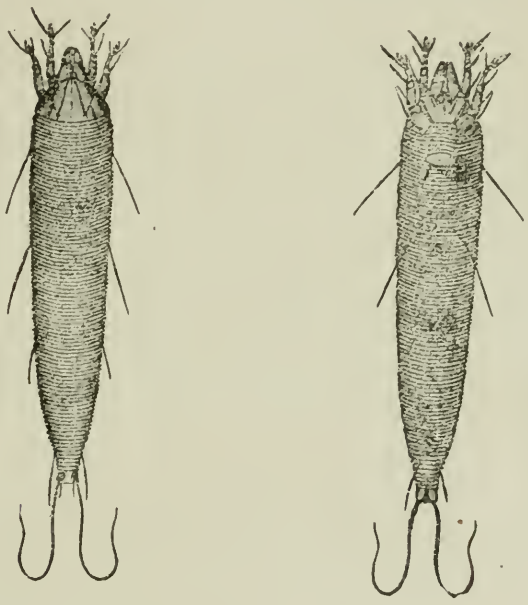
(2) To scrape the cankered areas on the limbs and to paint these areas with a disinfectant, such as copper sulphate, and to coat it with tar or paint;

(3) To cut off the smaller cankered branches wherever possible, and to burn them.

(4) To spray with Bordeaux mixture. Observations in New York have shown fairly conclusively that cankers are most abundant in those orchards that are not sprayed with Bordeaux. Applications of Bordeaux made year after year appear to have a cumulative effect in keeping down all kinds of fungus diseases.

The Apple Leaf Blister-Mite.

This enemy of the apple is an old enemy under a new guise. It has been known for many years in Ontario as a pest of the pear, but it is only within the last few years that its injuries to the leaves of apples in Ontario have been observed and have become worthy of serious attention. In Europe, however, this pest has for a long time been observed on apple leaves.



1 2

Apple Leaf Blister-Mites.
(1) Upper surface. (2) Lower surface. (After Parrott.)

The Leaf Blister Mite is not a true insect; it belongs to the group called *Acarina*, and is known to science as *Eriophyes pyri*. It is a very minute creature, about 1/125 inch in length, hardly visible to the naked eye. It has four legs and a wormlike body divided into a large number of rings by fine lines, and provided with a few pairs of stiff hairs. For the main facts regarding its habits I am indebted to Prof. Parrott, of the New York Agricultural Experiment Station, Geneva, N. Y., who has made a special study of this mite and many others of the same group; and who has very kindly given me the latest information he has obtained in his investigations of a difficult subject.

Life History. The Leaf Blister-mites feed by sucking the juices of the buds and leaves. They pass the winter under the scales of the buds, frequently in colonies. In spring as the young leaves unfold the mites move

out upon them, and soon burrow through the skin of the underside, and feed upon the juices of the soft tissues within. Through the irritation produced by these operations galls or blisters are formed. Within these galls eggs are deposited which hatch in a few days, and the young mites feed on the juices of the leaf. When mature they pass out of the leaves through openings made on the under surface, and betake themselves to other leaves to repeat the same process. Throughout the growing season the production of mites continues, and not until October do they desert the leaves for the buds, where they hibernate.

Nature of Injury to Leaves. As already stated, the main injuries are those done to the leaves, but the fruit stems and fruit are often injured.

The galls on pear leaves are at first greenish, then reddish, afterwards bright red, and finally, with the death of the affected tissues, brown or black, often most conspicuous on the sides of the midrib. When the mites are very numerous the injuries produce defoliation of the trees.

The color of the galls on apple leaves is much less striking than that on pear leaves. The galls are usually more abundant on the margins of the leaves, and are at first greenish, soon becoming brownish, and only occasionally red. The coalescence or merging together of several of the galls produce irregular-shaped dead areas, which often rupture at the margin. Parrott says: "About July first the most striking effects of the mites upon the leaves appear, especially if there is much yellowing of the foliage, as frequently occurs. Upon the upper surfaces of such leaves the mite-infested spots are of a light brown or of a dark green color, and are uniformly brown beneath. These spots are thickly massed, forming a dark, broad band of irregular width along each side of the leaf, which contrasts conspicuously with the intervening light yellow area about the main rib. To one standing on the ground and viewing the leaves from beneath, this striping of the leaves is very suggestive of variegated foliage of certain ornamental plants."

Remedies. Cultural methods are of little value in dealing with this pest. Careful pruning will of course remove large numbers of the mites, but it will not exterminate them. I believe Prof. Gillette, then of Michigan, first suggested in 1886 the use of strong soap suds, and kerosene emulsion during the dormant season as a means of control on pears. In 1890 Professors Comstock and Slingerland, of Cornell University, published (Bulletin No. 23, C. U. Ag. Exp. Sta.) the results of some experiments with kerosene emulsion in the control of the Blister-Mite on pears. In 1893 Prof. Slingerland published (Bulletin No. 61, C. U. Ag. Exp. Sta.) the results of successful experiments using kerosene emulsion. He said: "Our experiments strongly indicate that the Pear Leaf Blister can be nearly exterminated in a badly infested orchard by a single thorough spraying of the trees in winter with kerosene emulsion diluted with from five to seven parts of water."

All these experiments had to do with the Leaf Blister-Mite on pears. In the attempts, however, to deal with the same pest on apple it was found a more difficult task. The Geneva Station has made many experiments. In Bulletin 283, published Dec., 1906, the following recommendations are given, based on spraying operations carried on for two years:

(*a*) *Whale-oil Soap Solution* not effective.

(*b*) *Miscible oil* (1 part to 20 of water) effective.

(c) *Kerosene emulsion* (1 part to 8 of water) effective. Two sprayings are better than one, but if only one is practicable, make the application in early fall as soon as possible after the leaves have fallen.

(d) *Kerosene* pure—effective—but fruit crop lost.

Since the publication of Bulletin No. 283 the experiments have been continued, and new ones added; and as a result of two more years' work, Prof Parrott informs me that in a Bulletin soon to be published he will recommend strongly the lime-sulphur wash applied in the dormant season just before the buds burst. This application will at the same time take the place of the first treatment of Bordeaux mixture.

THE HANDLING OF THE STRAWBERRY PLANTATION.

By S. H. Rittenhouse, Jordan Harbor.

I start to prepare my land for a strawberry crop one year before the time when I want to set my plants, by manuring the field and planting a hoe crop, such as potatoes, roots, tomatoes or corn. The cultivation of this hoe crop during the previous year puts the land in excellent condition, destroys the weeds and otherwise makes the soil suitable for giving good results when I plant my strawberries. After the removal of the hoe crop in the fall I plow and put on a heavy coat of manure. In the spring I start cultivating early, working the manure into the surface, and getting the land into the very best possible shape for the setting of the plants. On my soil, which is a deep sandy loam, plowing is not necessary, and in fact I never plow manure in anyway.

When the field is thoroughly prepared, I mark both ways, making the rows three feet six inches apart and the plants in the rows from eighteen to thirty inches apart, according to the variety, some varieties make an excellent stand and form a splendid row when set thirty inches or even three feet apart.

I consider that one of the greatest elements that contributes to my success is my choice of the plants at the time of setting. The usual custom amongst strawberry growers has been to take plants from the side of the rows: this of course gives them the small and weaker plants.

In procuring plants I take up the whole row, taking only the best and strongest plants. This plan is along the line of plant breeding, a subject which should receive greater attention by practical fruit growers.

Of course it is scarcely necessary to say that plants should always be taken from a new row, a row grown the previous year and one that has never fruited. Some growers will sometimes take plants from the side of a row that has given a crop, but this should never be done.

The time for setting plants depends, of course, largely on the season. I do not favor too early setting, preferring to wait until the danger of heavy frosts is over—in our district from May 1st to 15th—and have had good results from plantations set as late as May 24th.

Cool cloudy days are preferred, but we do not wait when soil is in proper condition, only taking great care not to expose plants and roots to wind and sun.

After plants are prepared by digging and selecting only the best, and trimming off dead leaves and runners, and carefully straightening out the roots, and placing them compactly in an ordinary eleven-quart basket. I

use a man and a boy for setting. The man with the spade runs it into the soil about six inches, at an angle of forty-five degrees. Instead of drawing the spade out of the soil, he simply presses it away from him to raise the soil up, and then the boy with the plants places the plant behind the spade, the spade is withdrawn and the pressure of the foot completes the operation.

Great care is taken to get all the roots covered, and at the same time prevent the soil from covering the crown. I try to get the crown of the plant about on a level with the level of the field.

I have of late years preferred not to set the strawberry plants into the little track or furrow made by the marker, as it brought the crown of the plant too low down, and made it difficult to keep the crown from being covered while hoeing and cultivating. Therefore, I do not plant in the little furrow, but in one corner of the angle formed by the marker, and am careful to plant in the same corner of the angle all across the field, and when I am through setting the plants, they are in perfect rows both ways, just the same as if planted in the mark made by the marker.

As soon as plants are set we commence cultivating and hoeing, repeating this process every week or ten days until fall.

We cultivate crossways just as long as we can do so without injury to the new runners.

When hoeing the first time we invariably use the fingers around the plant, adjusting the soil so as to prevent any soil lying on the crown or leaves, and always keep the blossoms nipped off whenever they appear.

I consider that it is strict attention to small details that makes the difference between a profitable crop and an unprofitable one.

Towards fall, when the runners have begun to spread, instead of dragging them with cultivator to prevent the rows from getting too wide I cut them off with a roller plow coulter. It is quite a simple thing to attach a rolling coulter to each side of the cultivator with clips, and it does the work nicely and prevents the too thick setting of plants along the side of the rows, which is not desirable.

I have had some trouble with cut worms, but have not done anything to protect against them, except good cultivation of the ground the year previous when under hoe crop.

I do not mulch or use any protection whatever for the winter, and have had little trouble with my plants winter killing.

The following spring we do not cultivate before picking the crop, simply cutting weeds between the rows with a hoe and pulling out of the rows by hand whenever they appear. Great care should be taken not to have many weeds to remove at time of blooming, as much damage may be done to the crop at this time by disturbing foliage and blossoms.

We invariably crop the plantation two years, simply preparing for the second crop by narrowing up old rows after the first crop is picked and continuing the cultivation and keep rows free of weeds by hand the remainder of season.

Spraying with Bordeaux mixture is very important, and is especially so when plantation is kept over for second crop.

I have said nothing about varieties, as it is impossible to lay down a hard and fast rule. It is absolutely necessary that each grower study his own case, what is best suited for his particular district and market.

The Williams is the great commercial strawberry at Jordan. But it would not be so well adapted for a grower who was catering to a fancy local market.

The foregoing fairly describes our practice in handling a strawberry plantation. We do not claim that it is the very best, in fact, we know of many successful growers who follow out a different system. We do know that the strawberry crop has succeeded well with us for a number of years past, and has contributed very largely in making a balance on the right side of the ledger at the end of each year's operations on a small fruit farm in the Niagara fruit belt.

A. E. Sherrington, Walkerton: I prefer to use clover sod or a piece of land that has been in some crop during the previous season for the strawberry plantation, plowing it in the fall, and manuring it and preparing it in the spring. I am not favorably impressed with preparing the soil too well the season previous to planting. I like the rows 3 ft. 6 in. apart, and the plants two feet apart in the rows. Cultivation should be thorough; you cannot have too much in a dry season. The question of varieties depends upon locality. Climatic conditions have a great deal to do with the resulting crop. We may have a splendid plantation when the snow goes off and have a crop failure through light frost or dry weather. It is an important crop, and we realize a good deal from it in a good season; otherwise we make nothing. I take only one crop off a plantation and then plow it down. I find it cheaper to plant than to clean and cultivate the old bed. We have had considerable trouble with the May beetle taking the crop. Care should be taken to pick the berries so that when the customer gets them they will be just ripe. For the local market, a great many growers pick too green. I have seen strawberries on the market that were picked several days before they should have been. Berries should be dry when they are picked. They should not be picked till the dew is off or for some time after a shower of rain. In regard to grading, it can be done, but if we are thorough in cultivation, and have the land well fertilized and properly mulched during the summer, we can handle the fruit very well without grading. It is of course important to have clean packages. In the northern and western towns, I often see packages that are in a wretched condition, and often the boxes are only three parts full. Have clean boxes well filled. We pick the plantation over every other day, not every day, and in that way always have fresh fruit.

W. F. W. Fisher, Burlington: I was very much pleased with Mr. Rittenhouse's address. His views appeared to me both sensible and practical. There are two or three points that cannot be too strongly enforced. It pays to fertilize first before you put in the hoed crop which is to produce the strawberries, and again before you plant your strawberries. There cannot be too much attention paid to the selection of plants. I know there are some people who select their plants more carefully than I do. I am always in a hurry at the time of strawberry planting, but this is not to be recommended, as the selection of plants is always important, and should not be overlooked. Cultivation should be frequent. In marketing, it is very important to cater to the market you are supplying. The fancy local trade wants ripe berries. On the other hand, those who are supplying distant markets, such as Montreal, and the east, are required by the commission men to pick their berries on the green side.

L. A. Hamilton: Some six years ago I planted out a young orchard and set out strawberries between the rows. I do not find that the trees have suffered in consequence. The Ontario apple came into bearing in three years, which would show that it was not detrimental to the growth of the trees, and that an orchard can be established in that way without any cost beyond

the initial cost of the trees. In that orchard the crop of berries of the year before last ran over 5,000 boxes to the acre. Last year the crop was 4,000, and this year 6,500 boxes to the acre. So that I have, during the last three years, while growing a young orchard, produced an annual crop that would net $200 to $225 per acre. In picking, I start my pickers at the far end of a row so that they pick towards the packing house, and save carriers. I think that six baskets in a carrier is too many, as exposure to the sun is very detrimental to the fruit. In the Western States four-basket carriers are used. I use five, and find it an excellent plan, as in bookkeeping it brings in the decimal system. I have two crops from the same plants, and the second is practically as good as the first. We cultivate between the rows for the second crop just as for the first. At the end of the first season we mow and burn over the vines. Care must be taken not to burn in too dry a season, or the crowns of the plants will be burnt. This year for the first time I sprayed my strawberries according to Mr. Johnson's formula, and I attribute to that spraying the fact that I had a larger crop than ever before—far superior berries, and the foliage of the plants remained bright and green until the close of the season.

Mr. Rittenhouse: With reference to yield and returns, the following is my record with the Williams variety:—

1906, $2\frac{3}{4}$ acres, 1,000 crates, gross value, $1,250; 1907, $4\frac{1}{2}$ acres, 1,820 crates, gross value, $3,420; 1908, $3\frac{3}{4}$ acres, 1,140 crates, gross value, $1,375.

Estimating the value of the yield for the three years at $3\frac{1}{2}$c. per box would give a net return of $300 per acre, as compared with a return of $210 per acre for peaches.

OBSERVATIONS ON THE USE OF FERTILIZERS IN GERMAN ORCHARDS.

By Prof. R. Harcourt, O.A.C., Guelph.

Statistics show that, while one-sixth of the cultivated land in Germany is devoted to the growing of potatoes, sugar beets, turnips, cabbage, etc., only one-fiftieth is in orchards and gardens. This statement gives some indication of the relative importance of fruit culture in Germany.

Fruit growing is most successful in the middle and southern part of the empire, especially in Saxony, Franconia, and the Rhine Valley. But I did not see whole districts devoted to fruit raising as may be seen in some parts of this Province. An exception must be made in the case of the grape, which is the most important of the fruits grown in Germany. It is found most extensively cultivated in the Rhine Valley, the valleys of the Moselle and the Neckar, where all the lower slopes of the hills are literally covered with vines. Grapes of somewhat inferior quality are also grown in the valleys of the Saale and Elbe near Dresden.

Comparatively a small amount of these grapes are used for general household purposes, they are almost entirely converted into wine. To show the extent of this industry, it is only necessary to state that recent records prove that the annual production of wine in Germany is about 1,000,000,000 gallons.

My observation of actual orchard conditions in Germany were almost entirely confined to the neighborhood of Dresden, Leipzig, and Halle, or what might be called central Germany. The roads in this part of the country, like those in almost all parts of the old land, are narrow and wind-

ing, a noticeable feature being the absence of fences along the lines of travel. But in many districts a row of fruit trees, principally apples, plums, cherries, flourish on either side of the driveway, and when in bloom they make an exceptionally fine appearance, and take the place of unproductive ornamental trees, such as are seen in many parts of the old land. These fruit trees are the property of the municipality, corporation, or person who owns the road.

The common practice of the country is to sell the crop of fruit early in the summer, just after the fruit is set. The ordinary price is about twenty-five or fifty cents per tree, the purchaser to take all risks of the fruit being stolen, and to do all the work in connection with spraying, picking, etc.

The same evidence of thrift is manifest in the planting the sides of gullies or ravines with fruit trees. On one farm visited there were 16,000 trees planted on the steep sides of a ravine. The place where the tree was planted was terraced and kept free from grass. The fruit from these trees was sold in the same way as that along the road sides, and the otherwise waste land—for no stock is pastured—was made to do its share in increasing the profits of the farm.

One feature of the cultivation of the soil everywhere in evidence was the thoroughness with which it was done. The German farmer has not as many labor saving implements as we have, but labor is cheap, and they do not hesitate to make use of it. As an instance of this I may cite the case of one 2,000 acre farm visited. On this farm there were several hundred acres of potatoes and sugar beets, nearly 100 acres of peas and beans for canning, 90 acres of asparagus, besides rye, wheat, barley, and oats. All the crops, with the exception of rye, were hand hoed, and the ground was as clean and as free from weeds as a well kept garden. On this farm there was no orchard, but the sides of the lanes and rough places were planted with fruit trees, which were both ornamental and profitable.

Another point that is particularly striking to a stranger is the amount of trellis work in orchards and on their fruit experimental grounds. On either side of the main drive at the Diemitz Fruit Experimental Station there are rows of trellised apples and pears. These may or may not be profitable, but they show the methods of doing this work, and certainly add variety and beauty to the orchards. The trellising of fruits, as for instance, pears, on the sides and ends of old buildings, is very common; thus serving the double purpose of covering up the wall and improving its appearance, and of increasing the total revenue of the farm.

By way of further increasing the returns from the land, it may be interesting to know that fertilizers are quite extensively used on all farm crops. But the Germans admit that they have not studied the characteristic food requirements of the fruit crops so fully as those of the cereal and root crops. The subject, however, is receiving a great deal of attention, and as a result many valuable conclusions have been reached. It was my good fortune to visit several farms where fertilizer experiments on fruit crops had been carried on for several years. Among the most interesting of these was a series of experiments that had been carried on for sixteen years on an orchard at the Diemitz Fruit Experiment Station. The object of the experiment was to ascertain the effect of each of the important fertilizer ingredients on the growth of wood and the color, size, flavor and the yield of fruit. In other places there were special experiments with the various kinds of small fruits.

It is impossible in an article of this kind to discuss the results obtained in each individual experiment, but I shall endeavor to give in a general way some of the impressions gained as a result of my observation and through conversation with those in charge of the experiments.

In the first place, it would seem to be fairly established that the manurial constituents required per acre for the full development of fruit trees does not materially differ from that required for root and vegetable crops. But extensive experiments have repeatedly indicated that hoed crops, such as potatoes and sugar beets, make a better use of farmyard manure than fruits. It is further agreed that commercial fertilizers cannot take the place of stable manure, but that the best results are obtained when both are used, the one supplying humus and some plant food, and the other supplementing the deficiencies of the mineral constituents in the stable manure.

At Diemitz and Stassfurt, I had a good opportunity of observing the results of the application of fertilizers on the apple orchard, which, after grapes, is the most important fruit of Germany. In both places experiments have demonstrated that mixed fertilizers, containing the three essential manurial constituents—potash, phosphoric acid, and nitrogen—can be used with profit, but that the lack of potash affects the results more than any other one constituent. Where potash was not supplied, even though light dressings of stable manure were made every three or four years, the trees have assumed the appearance of those grown under adverse conditions, on poor soil, etc., the growth of wood is arrested, the leaves are small and have an unhealthy color and are covered with yellow spots. After the fruit is matured there is some growth of wood, and the next spring there is put forth an abundance of blossoms, of which, however, few develop, owing to the lack of proper nourishment. In spite of the fact that there is an abundance of phosphoric acid and nitrogen in the soil, most of the fruit falls off during the summer. and in consequence, the yield obtained when potash is not supplied is very little greater than when no fertilizers are used. I may say, however, that these conditions are not general—certain varieties showing a marked ability to thrive under unfavorable conditions. In fact a number of these varieties which were pointed out to me form strong wood and large leaves, and apparently possess the ability to throw off the superfluous fruit which the tree is not capable of fully maturing. Lack of nitrogen in the soil has been shown to have a somewhat similar effect upon the development of the fruit, although not so pronounced; while the absence of phosphoric acid is even less noticeable.

Experiments have fully demonstrated that the use of a complete fertilizer will more than double the yield of plums. Where nitrogen was omitted, the yield was much lower, and where phosphoric acid was lacking it was still lower. In fact, the results of German investigations appear to indicate that the yield of stone fruits is more influenced by phosphoric and nitrogenous manures than core fruits. It is quite possible that this is due to the fact that stone fruits have a large kernel which is rich in phosphoric acid, and, as the proportion of the kernel to fruit is much larger in stone fruits than in core fruits, the former have a greater need for phosphoric acid.

The results of fertilizer experiments with gooseberries indicate that potash is the most important constituent in influencing yield. With some varieties phosphoric acid stood second and nitrogen third, and with others the nitrogen ranked second and the phosphoric acid third. It would, therefore, appear that, while different kinds of fruits make use of the various manurial constituents in different proportions, the different varieties of one kind of fruit also have their own peculiarities, which have to be studied.

Strawberries have been found to respond readily to the application of commercial fertilizers. The study of their requirements is not so difficult as are those of other fruits. This is partly because they come into bearing

quickly and partly due to the fact that they are generally grown in rotation with vegetables. Experiments have demonstrated that the complete mixture of fertilizers give the largest yields, and that, on ground in good condition, the plot that received no nitrogen gave nearly as good results, while if either potash or phosphoric acid are omitted, the yield is seriously diminished,

From these observations it is not surprising to find that the general opinion among many German fruit growers should be that potash and phosphoric acid are of the utmost importance in the development of fruit bearing trees and bushes. Even if these constituents are applied in excess no harm will be done, whereas an excess of nitrogen may injure the trees, and, besides, exert an unfavorable influence on the composition of the fruit. Large applications of nitrogen to strawberries, especially if the season happens to be a wet one, causes the berries to begin to decay early. Apples are said to be similarly affected, while gooseberries, raspberries, and currants are affected to a lesser extent.

Regarding the quality and flavor of fruit, the results of German investigators show that the presence in the soil of an abundance of phosphoric acid and potash is extremely important; on the other hand, where nitrogen is somewhat deficient the effect on the quality was scarcely perceptible.

Considerable work has been done on determining the influence of the several ingredients on the size of individual fruits. With core and stone fruits the experiments are not far enough advanced to warrant definite conclusions, but with berries, a greater number of results have been obtained, and these appear to indicate that the lack of phosphoric acid did not materially decrease the size of the berries as compared with those grown where a complete mixture of fertilizers was used; but when potash was not applied the berries were smaller; and where the nitrogen was left out, they were still smaller.

Another question which is receiving a great deal of attention is whether a different action is detectable when nitrogen is applied as nitrate of soda or sulphate of ammonia or horn meal, the phosphoric acid as ground bone or superphosphate, or the potash as the chloride or sulphate of potash. So far as I was able to learn, no definite results have been obtained.

The problem of what quantities of fertilizers must be used to force maximum crops and whether these large quantities will sufficiently increase the yield to pay for the extra cost of the fertilizers is also being studied.

Laboratory investigations are being made to ascertain the amount of the fertilizing constituents in the various fruits and the distribution of these in the plant.

In conclusion, I may say that the Germans appear to have proved to their own satisfaction that the use of commercial fertilizers on general farm crops is profitable, and they are now making a serious effort to gather sufficient data to enable the fruit grower to use these substances intelligently.

President PEART: Too many of our orchards are decidedly lacking in food. The problem with most of us is what special food should I give? Each one tries to be economical in the management of his business, and if we had information as to what was the proper food to apply to a given orchard and to a given variety of fruit in that orchard, it would be of very great service. The matter is now open for discussion, and I should like to ask Prof. Harcourt whether it is the practice of German fruit growers to use commercial fertilizers largely?

Prof. HARCOURT: So far as I was able to judge, they are using them largely for all crops, including fruit.

Q.—How would you apply potash in this country? Would wood ashes answer?

A.—It is a question of buying them right. If you knew the materials from which they were made, you could form some idea of what they were worth. Ordinary ashes do not contain more than five or six per cent. of potash. Some samples we have analysed have contained as low as half per cent. I would not for a moment say that good wood ashes should go out of the country, but would like to put in the caution I have mentioned. We can usually estimate 5c. per pound for potash in ashes. With 5 per cent. ashes that would mean 25c. per 100. Then there is a little phosphoric acid and lime, which would raise it to 35c. per 100, at the very outside. If you have any way of knowing that they have not been leached, they may safely be bought at that price.

Q.—Would it be better to pay $5 or $6 per ton delivered than to buy commercial fertilizer?

A.—The form in which you buy potash in commercial fertilizer would be either as sulphate or chloride of potash, and you would pay 5c. or 6c. per pound.

Q.—How would 12c. a bushel do for ashes?

A.—If a bushel means 60 lbs., I think you would be safe at that figure.

Q.—How does the price there compare with here for ready mixed fertilizer?

A.—As a rule, they buy the different constituents and mix them themselves, which of course is the right way.

Q.—Is sulphate or muriate of potash best for potatoes?

A.—Chloride of potash should never be used on potatoes where you care for the quality and mealiness of the potatoes. In Germany a great many potatoes are grown for starch making, in which case it does not matter.

Q.—In using potash, how would you apply it?

A.—It may be applied when the soil is being cultivated. There is no loss of potash from the soil. It is therefore better to apply it early, and allow time for combining with the soil.

Q.—You would not put nitrate of soda with your other fertilizer when you plant your potatoes, would you?

A.—Nitrate of soda should be fed to the plants.

Q.—You will get better results sometimes from ground bone the second year than you will the first?

A.—It depends on how finely it is ground. It should be ground quite fine.

Q.—Is it cheaper to buy rock phosphate or ground bone? The former is $14 per ton and the bone meal about $30.

A.—Rock phosphate will not come into solution in the soil so readily as bone phosphate. I would not hesitate to use rock phosphate on soil that is rich in humus if I wanted to build up a reserve on that soil, but not for immediate results.

Q.—Would there not be some nitrogen in the bone?

A.—That is removed before it is ground.

Q.—When you use 10 tons of green barnyard manure per acre each year, what proportion of phosphoric acid would you add to get results on an ordinary soil?

A.—Ten tons of green manure would be equivalent to about 75 lbs. of phosphoric acid. But the annual application of ten tons of farmyard manure would give too much nitrogen for the growth of the plant, although it would in itself contain enough potash and phosphoric acid. That is a point

to consider in mixing fertilizer with farmyard manure. Farmyard manure may be used to give humus in the soil, and then build up on the other side with commercial fertilizer. I should be inclined to use much less farmyard manure than that and build up with ash constituents. Unless you have plenty of humus and give good cultivation, you will not get the value of the potash.

Q.—How would you fertilize grapes?

President Peart: I might attempt to answer that question. I have three acres on light, sandy, gravelly loam. Perhaps once every five years I apply barnyard manure and the rest of the time I use potash, usually muriate, at the rate of 200 lbs. per acre. The last time I used sulphate, as I thought that possibly the sulphur element might tend to prevent mildew of the grape, I do not know whether that is scientific. The general results have been very good.

Prof. Harcourt: I think it is generally recognized that potash is the fertilizer for grapes.

Q.—In regard to rotted manure, is this really what we have been supposing it to be, or have not the best elements been rotted out of it? My experience is, that rotted manure may be very well as a stimulant in the spring, say on early vegetables, but that as an application on the surface of the soil, it is by no means equal to green manure.

A.—I think it largely depends on how much leaching has taken place during the rotting processs. You cannot rot the constituents out of it, but they become soluble and may be washed away. There is no doubt at all that the quicker you get farmyard manure on the ground the greater the value you get out of it. Green manure has a very beneficial effect on the texture of clay soils, improving their physical condition. Heavy applications of coarse manure on sandy soil will, on the other hand, open it up too much, so that it will not hold water.

Q.—Can you get any idea as to the contents of a car load of stable manure from analysis?

A.—If the sample were taken in a great number of places through the car, you might get a fairly representative analysis.

Q.—What is the relative value of farmyard manure from different classes of stock?

A.—As a rule it is a mixture from all classes of stock.

Q.—I have in mind where a farmer feeds 40 or 50 head of cattle on a heavy grain ration in winter.

A.—That would be the richest kind you could buy, richer than from dairy stock.

Q.—Would the grain furnish potash?

A.—There would be more potash from the straw; the grain would furnish phosphoric acid. About 90 per cent. of the phosphoric, nitrogen and potash contained in the feed would occur in the manure from full grown animals, as these animals are putting on principally fat. In the case of young animals, the amount of these elements that goes to the manure pile would not be more than 60 per cent. This is not the case, however, with cows giving milk.

Q.—What fertilizing element is responsible for color in fruit?

A.—I asked this question a number of times when in Germany, but never got a satisfactory answer. The feeling was that when an abundance of the ash constituents—potash and phosphoric acid—were present they felt very much surer of color than would otherwise be the case. If we want fruit to be of the highest quality as regards texture, firmness, color and keeping

qualities, it must go along with ash constituents, and not with too much nitrogen. Where the trees are too thick, and the fruit too much shaded, of course you get poorly colored fruit.

Q.—At what time would you apply manure?

A.—Whenever you can get it on with the least labor. That may not apply to hilly ground, however, as a great deal of it might reach the low ground in the spring.

Q.—Is there very much loss hauling green manure out to the field and allowing it to heat?

A.—You cannot rot manure in any form without loss of nitrogen. Whenever you can smell ammonia, there is nitrogen going off in that form. However, the best time to get manure on the ground is as soon after it is made as possible.

Q.—Our soil is a little sandy?

A.—Then you have to sacrifice a little nitrogen for the sake of having rotted manure, or else cut the straw before using it for bedding.

Q.—What proportion of the potash and phosphoric acid is contained in the liquid manure?

A.—The liquid contains most of the fertilizing constituents.

Q.—And that is lost in a good many stables?

A.—Yes, when we say that 90 per cent. or more of the different elements is left in the manure pile, it is taken for granted that the liquid is properly looked after by using enough bedding to absorb it.

FUNGOUS DISEASES OF ONTARIO ORCHARDS, PEACH YELLOWS AND PEAR BLIGHT.

By M. B. Waite, Pathologist in Charge, Investigations of Diseases of Fruits, U. S. Department of Agriculture.

I am called upon to discuss two very common and destructive diseases of the orchard; peach yellows, the most dangerous and deadly disease of the peach tree, and pear blight, the contagious and destructive disease of pomaceous fruits. Neither of these diseases is preventable by spraying.

I will precede this discussion with a short account of the treatment of some of the prevailing fungous diseasese in this section, and will tell something of sulphur as a fungicide, particularly the new self-boiled lime-sulphur mixture.

Sulphur vs. Copper as a Fungicide.

Although both sulphur and copper have been known to possess the property of killing fungi for many years, sulphur antedates copper as a practical fungicide. It was in fact in use long before the year 1886, when the word "fungicide" was coined. The discovery, widely published in 1885, by Millardet, at Bordeaux, France, of the remarkable fungicidal properties of the copper-lime mixture, put copper far in the lead as a useful fungicide. Since that time it has been brought out that the practicability of this mixture depends not alone on the copper. It is the peculiar combination of copper and lime and its resulting properties that gives it its value. Much experimenting has been done with other compounds, mainly of copper, yet to this day no compound of copper has been found approaching it in value. The peculiar properties of Bordeaux mixture are that it is harmless, or nearly

harmless to most plants when sprayed on them during active growth, it sticks tightly for weeks and even months on the plant after it is applied, it is nearly insoluble, and yet will dissolve just enough in rain water to give this sufficient copper to kill most fungi. There is no trouble in finding poisons and chemicals that will kill the fungi; the problem is to find poisons sufficiently insoluble so as not to hurt the plant and yet which will continually give off just enough of the fungicidal material to do the work when needed.

During the last twenty years, Bordeaux mixture has been recognized as the most satisfactory fungicide available. We can now, it is believed, use sulphur in somewhat the same way. Let us think for a moment what we have available for experimentation in this connection. Beginning with the simplest form, we have flowers or flour of sulphur, which can be used for dusting on a plant. The California grape growers use it for mildew on the grape. It is almost insoluble in water, but by making a cream of lime, and mixing the sulphur with it, we have, after it has cooled, a spraying material consisting of lime and sulphur in an uncombined state, with the lime water to fasten the sulphur on the plant. This form is used only on the tenderest of plants.

Second, take sulphur and lime, five pounds of each per barrel; put the lime in the barrel and pour on cold water. Then at once add the sulphur and stir them up together, and you have cold-water or self-boiled lime sulphur wash.

Then, if you use hot water instead of cold water, you get greater heat and a little more of the sulphides. This makes a most beautiful mechanical spraying mixture.

Then, as you know, we have the boiled lime and sulphur, in which after slaking the lime and sulphur together, you add heat and keep up the cooking process until all the sulphur is brought into solution. I might add to this the factory boiled lime and sulphur, which is a concentrated solution of the latter class of preparation.

Q.—At what time would you apply the self-boiled lime and sulphur for peach rot?

A.—Four times; first, when trees are dormant; second, when the peaches are well set, the third to follow in two or three weeks, bringing the fourth about a month before ripening.

Q.—Is there any method of controlling pear blight by treating the soil?

A.—No; there is a method of influencing, but not of controlling; you can control it to some extent.

With sulphur we have had available for use either the extremely soluble compound, like the boiled lime-sulphur wash, which scorches or burns living plants, the liver of sulphur, which has to be used extremely dilute when applied to the foliage, and which is readily soluble, so that it washes off with rain, or else the comparatively insoluble flowers of sulphur. The latter substance is not sufficiently active as a fungicide to be used alone.

The Self-Boiled Lime-Sulphur Wash. Recently, through the investigations of Mr. W. M. Scott, of the U.S. Department of Agriculture, the peculiar value and desirable properties of the self-boiled lime-sulphur wash have been discovered. This mixture is very simply made by adding the flour or flowers of sulphur to the lime before slaking. No heat is used except the heat produced by the slaking lime. The value of this preparation was discovered by Mr. Scott in seeking a remedy for brown rot of the peach. He found not only that this mixture was an excellent fungicide, preventing the brown rot and black spot of the peach, but when properly made with a small quantity

of soluble sulphides, it could be applied to peach foliage with perfect safety. For the first time, then, we have a practicable fungicide, with fairly good sticking qualities, slowly soluble and not injurious to peach foliage. It may also be sprayed on the sensitive Japanese plums. This important discovery was made in the season of 1907, and very satisfactory results were obtained. In the season of 1908 they were repeated by Mr. Scott and his assistants, and by some other investigators, and great success was attained in the prevention of several of our leading diseases. This gives us practically a new fungicide, which is in many ways a rival of Bordeaux mixture. It does some of the things that Bordeaux mixture will not do; on the other hand, it does not quite equal Bordeaux mixture as a fungicide, and unless a better form is discovered than we have available now, this mixture should not displace the standard Bordeaux except where the latter is injurious.

The important point has been gained, that in the treatment of peach diseases where the use of Bordeaux mixture or any other copper compound had to be abondoned, we still have a most excellent and thoroughly practical fungicide. From the results obtained from recent experiments, it is quite probable that on the Ben Davis, and possibly even on the Baldwin apple, where russetting by Bordeaux is a serious matter, we can still spray our fruit with a fungicide that will give satisfactory results.

Furthermore, attention should be called to the fact that this sulphur spray, while slightly inferior to Bordeaux mixture, is a most excellent insecticide, especially for certain types of insects. It is the deadly enemy of mites and scale insects. The self-boiled lime-sulphur mixture was tried as a scalecide on dormant trees and put in the background by the more active form of sulphur in the boiled lime-sulphur wash, but it looks as though we had here an excellent scalecide, thoroughly satisfactory for use when the trees are in foliage, in addition to its other merits as a fungicide. It is expected that the entomologists will work out the exact status of this spray as an insecticide. However, at the present time they do not advise its use as a dormant spray.

Factory-Boiled Lime-Sulphur. Recently, several of the chemical manufacturing firms have put on the market stock solutions of the boiled lime-sulphur wash. These are more perfectly prepared, at least from a chemical standpoint, than the ordinary home-boiled wash. They remain in perfect solution and require only dilution with water to be ready for immediate application. Recent experiments have shown these preparations to give excellent results in the summer treatment of the more resistant plants, like the apple, cherry, and others, in comparison with Bordeaux. If the factory-boiled solutions can be put on the market with sufficient economy they may have very widespread use, not only in supplanting the self-boiled and the boiled wash, but also in competing with Bordeaux mixture.

Apple Scab.

The principal fungous diseases of the apple in Ontario, preventable by spraying, is the apple scab, caused by the fungus *Venturia inaequalis*. This disease, which is very susceptible to the influence of wet weather, is only preventable in a moist season by thorough spraying. The first treatment should be made when the trees are in bud, the second when the last petals are falling, the third about two weeks later, the fourth two or three weeks later, and the fifth a month later, making the last treatment occur the last week in July or about August 1st. The fungicide giving the best results for this is the standard Bordeaux mixture, say the 5-5-50, or, if the spraying

is done copiously, the 4-4-50 formula will answer about as well. The new self-boiled lime-sulphur wash gives good commercial results when sprayed on the same dates, and, if we had nothing better, would be considered entirely satisfactory; but the Bordeaux mixture slightly exceeds it in efficiency. It is slightly more persistent, sticks on the fruit and foliage more thoroughly, so that the longer intervals between the latter sprayings are slightly more effective. To either of these mixtures one-quarter of a pound of Paris green per barrel, or, from one to two pounds of arsenate of lead may be added for codling moth and other insect enemies.

Pear Scab.

The pear scab, caused by a related fungus, is amenable to the same treatment. In both of these diseases, the factory-boiled lime-sulphur has been shown to give good results when diluted sufficiently so as not to burn the foliage immediately after application. One part to forty, or perhaps one part to fifty, concentrated stock solution is the dilution required. If these preparations can be brought to the standard and rendered non-injurious, they will make a very convenient spray mixture for this purpose.

Cherry Leaf Blight.

Both the sweet cherry and the sour cherry over a large part of Michigan and New York State have been very severely defoliated by the cherry leaf blight fungus, *Cylindrosporium padi*. This disease seems to have increased in severity during the past few years, until cherry growing without spraying is almost impossible. Further south some of the varieties of cherries have been killed off, or rendered worthless, commercially, by the repeated attacks of this leaf blight. Some of the varieties of plums, notably the Lombard, are so badly defoliated by the same fungus as to require treatment. Fortunately, two or three thorough sprayings with either the standard Bordeaux mixture or the self-boiled lime-sulphur give perfect results in preventing this disease. Two or three treatments, the first made after the trees are in full leaf, and the second and third following at intervals of three to four weeks, give most excellent results.

Peach Curl Leaf.

Probably the most important fungous disease on the peach in this section is the curl leaf. This is also perhaps the easiest of all fungous diseases to prevent. The plants can be rendered almost entirely free from it by a dormant spraying. From the fact that the trees are dormant when treated, almost any fungicide can be used with entire satisfaction. The treatment with standard Bordeaux mixture of the 5-5-50 formula is slightly superior to any other. Even the simple solution of copper sulphate, 3 pounds to the barrel, answers fairly well. Probably the best general treatment of the peach orchard is to spray it with this standard boiled lime-sulphur wash, since this will prevent not only the leaf curl, but the San Jose scale and certain other insect enemies. The factory-boiled lime-sulphur apparently answers just as well in this case. This single treatment can be made either in the fall or early spring. It can be given just before the buds begin to swell in early spring, or, if this interval is too short, and for other reasons it is more convenient, it can be applied in the fall after the leaves are off.

Peach Brown Rot.

In certain wet seasons where the heat and moisture are unusually great, peaches are attacked by the brown rot fungus. This disease is especially prevalent and destructive in the humid Southeastern United States, from Pennsylvania southward, but occasionally it does bad work in the Lake States and in Canada. Fortunately, through the investigations of Mr. Scott, with his self-boiled lime-sulphur, in the season of 1907, this malady is now added to the list of commercially controllable diseases. On account of the entrance of the fungus through weather cracks, caused by moisture, and through insect punctures, it is rarely possible to control more than 90 per cent. of the disease, but to one who has seen the frightful destruction of a crop attacked by this fungus, 90 per cent. seems large. The standard mixture for this disease is made by placing five pounds of stone lime in a barrel, pouring over it five pounds of flour or flowers of sulphur, and slaking the lime with just sufficient cold water to do a good job, and give a creamy. pasty mass. This should be stirred occasionally and the barrel kept covered for twenty minutes with gunny sacking, or some similar protection. At the end of that time it should be diluted with cold water to the capacity of the barrel. It can be used at once or kept for several hours diluted, but should not be kept in concentrated form, as it gains in soluble sulphides.

The treatment for Monilia or brown rot fungus entirely prevents the the black spot of the peach, often a serious disease. In fact, one or two treatments for this disease alone will often pay a good profit. This treatment should be made about three weeks after the blossoms have fallen, when the young peaches are, say, three-quarters of an inch long, and can be followed by a second one, three or four weeks later.

Pear Blight.

Description. The well known bacterial pear blight, caused by a tiny bacillus, is one of the prominent orchard diseases in this part of the country. It attacks particularly the pear and the apple, but also affects the quince, the Siberian crab apple, the wild crab apple, the Hawthorns, and practically all the fruits of the pome family. The germs producing the disease enter the tree in three different ways: first, and most commonly, through the blossoms, being distributed from flower to flower and tree to tree very widely through bees and other flower visiting insects; second, through the tender tips of growing shoots, including the water sprouts at the bases of the trees; and third, directly into the fleshy bark. Infections of this latter type are few in number, but result in a very serious form of the blight. The amount of damage resulting from an infection may vary enormously. Thousands of infections simply kill the blossom cluster or a few inches of the tip of a growing twig. On the other hand, the blight may run down on to large branches, or run clear to the ground, killing the whole tree, or it may spread from a lateral infection, doing more or less damage. The spread of the disease, the number of infections, and the amount of extension of the blight on a tree after infection are dependent upon a number of different conditions. The factors controlling an outbreak of pear blight may be summed up as follows:

1. The presence of the germ and the amount of holdover blight available for reinfection.

2. The amount of bloom on the trees. It is difficult for young orchards to catch the pear blight until they bloss m.

3. The number of insect visitors available. This is largely, however, constant if the next is favorable.

4. The weather during blossoming time. If the weather is favorable for insect activity and nectar secretion, the blight germs are generally carried about. On the other hand, rainy weather or cold, dry sunny weather discourages the spread of blossom blight.

5. The variety and species of the tree. Each different horticultural variety and each species of pomaceous fruit has a different relative resistance to the disease.

6. The age of the tree. Young trees are more susceptible than older ones. The most susceptible age comes at the time the trees are first in bearing, say the first four or five years they are in bearing.

7. The vigor of growth. This is influenced by fertility of the soil, soil moisture conditions, favorable weather, artificial manuring, fertilizing and cultivation. In general, those conditions most favorable to vigor of growth of the tree are most favorable to the blight, and, conversely, those influences which dwarf or check the growth of the tree tend to hinder the progress of the blight.

Most of the blight dries out in the trees during the summer. On the other hand, occasionally at the bases of the blighted twigs, or more commonly on the thick fleshy bark, on the large limbs and on the bodies of the trees, the blight keeps slowly progressing until the close of the season. The germs die out in the dead bark, but keep alive on this advancing margin, and the cool, moist weather of winter, though it checks their growth, tends to keep them alive until spring. This type of blight we call "holdover blight," and is the source of the new infections each season when the trees spring into growth.

Collar Blight. I wish to call particular attention to the forms of pear blight known as body blight and collar blight. Body blight occurs abundantly on young trees, more particularly on young Bartlett and other pear trees, but it may even kill young apple trees. Frequently the blight gets into the thick, fleshy bark on the body of young trees, either by running in through a fruit spur or water sprout, or by means of the punctures of insects or mechanical injuries. Possibly the germs may enter directly into the fleshy bark through growth cracks. Once in the fleshy bark the germs rapidly spread in all directions. They extend vertically in the direction of the vessels and fibres more readily than they do laterally. Oftentimes the infection is at the ground line or at the collar of the tree. Sometimes even below the soil line. The blight then spreads on the moist bark in all directions. Below the soil it more readily spreads in a lateral direction around the collar and down the bark of the roots. Frequently large irregular areas are formed, and quite often they girdle the trees, absolutely killing them. Sometimes a V-shaped area runs up from the point of infection on to the body. French stocks are often more susceptible to blight than the grafted top, even though the latter may be the susceptible Bartlett. Trees affected with body blight usually take a year to die. This is unlike the branches, which are, of course, killed by the blight of the current season. Trees often live another year, and sometimes a second, even though completely girdled, and show the destructive effects the season after the blight has done its work. Sometimes the blight germs have died entirely out of the bark and the dead bark has dried up, and yet the tree dies the following year from girdling. In case of a collar blight, where it does not completely girdle the tree, the tree often takes two or three years or more to die, but finally does so from the girdling. A small amount of blight at the collar or around the body does the maxi-

mum amount of injury. This type of blight may be regarded as the most injurious, and more trees are killed by this form, as a rule, than from blight in the top. It is also the hardest for the orchardist or inspector to find. However, it produces one very striking symptom that often leads to its detection. The foliage on these girdled trees, or even on the particular side of the tree attacked, begins to take the reddish autumnal color from midsummer on. In walking through the orchard after the first of August, these reddish trees or reddish parts of trees are usually distinguishable from a distance. These premature reddened or bronzed leaves often contrast very strongly with the normal dark green foliage. This is particularly true of well kept orchards. The reddening of the foliage is not always an infallible guide, as sometimes branches color their leaves red from other diseases, root troubles, girdling by mice, and unknown causes. On examining these reddened trees, however, the blighted area can usually be found.

At least two types of frost injury also very closely resemble pear blight at the collar. In one of these the tree is injured from the soil line upward, usually on the sunny side, but not always so. Blight is easily distinguished from this winter sun scald when the latter occurs as an elliptical area on the main trunk of the tree from the soil or snow line nearly to the branches. On the other hand, another type of frost collar girdle reaches but little above the soil line, or only occasionally extends upward in a V-shaped area, but spreads well under the ground, partially or wholly girdling the tree. Still another type, is that of root winter killing. In this case the roots near the surface of the ground are frozen and killed, while the top of the tree may or may not be injured by frost. It is necessary to know these other collar injuries in order to distinguish them from true collar blight.

Treatment. Referring again to the factors influencing pear blight, it will be noted that the presence of the germs is of primary importance. If the pear blight germ is not present in the orchard or in the immediate vicinity, there can be no blight. When spring opens up and new growth begins, if the germs are present or conveniently nearby, and the conditions favorable, blight has a great opportunity to spread and accomplish its work of destruction. If, on the other hand, the germs do not occur, no matter how favorable conditions may be, there can be no blight. The main method of controlling pear blight is to cut out the holdover blight. This is usually best done in late summer and autumn, but it may be done at any time through the winter or early spring before the blossoms appear. When blight occurs on the main limbs or on the collars of the trees, one of the principal things in combating the disease is to find all the cases, especially where the blight occurs under the rough bark. It requires close examination to find and remove all the blight in the top of the trees, but this can best be done in the summer or early in the autumn, while the foliage is still on, the blackened dead leaves enabling one to easily locate the blighted branches. Summer cutting out of pear blight must be regarded, however, as of secondary importance in the treatment, though still a good thing to do, when followed by later treatment. On rapidly growing twigs and branches it is usually necessary to cut a foot or more below the lowest discoloration of the bark. In fall and winter pear blight cutting, it is usually possible to cut pretty close to the blight, say four to six inches, or, where it has thoroughly died out an inch may do. On the other hand, when the blight blends off imperceptibly from the dead bark into the live bark, as it often does in summer, from one to two feet below the lowest point may be considered necessary.

In all work of cutting out pear blight a disinfectant should be carried to sterilize the tools and cut surfaces. For this purpose, one of the most convenient germicides is a 1-1,000 solution of corrosive sublimate. A bottle of

this can be carried in the pocket, and a sponge, tied to a string, kept saturated with this solution. After trimming out the blight or removing the blighted bark from a diseased area, the cut surface, as well as the instruments, should be sterilized before turning to another infection. It is possible with proper tools, such as a gouge, draw shave, or box scraper, or better, a specially made scraper, to remove the bark from a blighted area, disinfect the surface and thus save a large limb or the trunk of the tree instead of removing the same. All small limbs which can be easily spared should be cut out in removing the blight. The object of the treatment of pear blight is to cut all blight from the trees and save all the healthy parts that can be saved. Blight completely kills the bark of that portion of the tree which it reaches, but leaves the rest of the tree wholly uninjured. The only exception to this is where the girdling effect is produced by the blight at the collar or on the branches. Very few orchardists thoroughly know and understand pear blight. It has been with them so long that they regard it as one of the inevitable troubles of the pear, and in fact the apple as well. Still less generally known are the modern methods of controlling this disease by eradication.

Peach Yellows.

Cause of the Disease Unknown. The cause of the peach yellows is unknown, but it behaves precisely like a parasitic disease. It is contagious, spreads through the orchard from colonies or from individual trees which become centers of infection, and is distributed from tree to tree and orchard to orchard by natural methods unknown to investigators. In all respects, therefore, it acts like a parasitic contagious disease. Up to the present time all microscopic and bacteriological methods of investigation have failed to reveal any parasites. Investigation along these lines have been wholly negative, although they have been pursued especially in years past with great persistence and thoroughness. It seems almost certain that had it been an ordinary germ or bacillus, the methods employed would have revealed the same. It is hard for me to believe that the disease is not a parasitic disease, however, and that some day the parasitic organism will be found. The failure to find the cause of the disease or any definite parasite associated with it put this discussion of peach yellows, which I am called upon to give you, on a different plane from that of the ordinary fungous or bacterial disease of plants. However, by comparison with definitely known germ diseases, such as pear blight, and with a general knowledge of physiology and pathology, we may be able to steer clear of false theories and make the most of the facts available.

Symptoms. The most reliable symptoms of peach yellows is the premature and red spotting of the fruit. Another symptom almost equally certain is the bushy or wiry twig growth often resulting from premature pushing of lateral buds. Diseased trees, more or less promptly, assume a sickly or yellow color in their foliage. The leaves often have a peculiar roll and droop. After the second year the twigs and branches begin to die back, and the tree gradually dies from the top down, ordinarily becoming totally dead at four or five years from the appearance of the first visible symptom.

The leaves on trees affected by this disease usually turn yellow rather promptly. This results in the common name of the malady. However, frequently when the trees are first attacked and the fruit decidedly red spotted and premature, on the whole tree or on certain branches the leaves, instead of yellowing, become even darker colored and larger than normal.

That is to say, when the yellows first attacks strong, vigorous trees, it sometimes stimulates the tree, both fruit and foliage, before it begins to weaken it. This may even hold true the second year in some cases. The twig growth is shorter on such trees. They behave like trees on which summer pinching of terminal buds is practiced. Ordinarily, however, especially on trees under average cultivation, the yellowing of the inside leaves begins as soon as the premature fruit appears. Sometimes these leaves are distinctly rolled upward toward the mid-rib and droop and curve inward by the bending of the leaf stem and mid-vein. This symptom is more or less variable just as the presence of the yellows sprouts may or may not be prominent.

Other Causes of Yellowing. I hardly need to say here that many other causes produce yellowing or discoloration of foliage. These other yellow effects need have no relation whatever to the yellows and, of course, occur on most all trees and plants, whether they are affected by the yellows or not. Some of the principle causes of yellowing of the foliage of peach trees, in addition to borers and frost girdling, are starvation or poverty of the soil, particularly nitrogen starvation, the fungous root rot, sour soil, root aphis, the root knot or eel worm disease, root winter killing, and various other root troubles. These diseases, except the fungous root rot, are all more or less curable and non-contagious, and, of course, should never be confused with the true yellows. A yellow peach tree, therefore, does not necessarily mean a tree affected by peach yellows.

Related Diseases of the Yellows Group.

Two other diseases should be mentioned in this connection as they belong to the same general group as the yellows. They are the "little peach" of the Northern States and peach rosette of the South.

Little Peach. The little peach is particularly important inasmuch as it occurs quite seriously in Michigan, New York and Ontario. This disease resembles yellows in many respects, particularly in its foliage symptoms, yet it is very distinct, in fact the opposite in other respects; namely, its fruit symptoms. The fruit on trees affected by little peach is undersized, belated in ripening, but similar in color and appearance to the normal fruit. Especially in the imperfectly developed specimens, it is rather flat and insipid, but not so distinctly off flavor as in the case of the yellows. The fruit may be only slightly reduced in size in mild cases, or in extreme cases may be reduced to tiny peaches less than three-quarters of an inch in diameter. Trees affected by the little peach rarely produce the wiry, bushy growth. When forced to throw water sprouts by heavy cutting back or winter killing, they do to some extent make twig growth resembling yellows. Trees with the little peach *usually* roll their leaves upward and droop the foliage as yellows occasionally does. The leaves begin to discolor on the inside of the tree, especially on the main limbs and the yellowing proceeds outwardly as the season advances. Little peach is quicker than yellows, killing the tree ordinarily in three years instead of four or five years. The twigs die back from the top in the same way. It apparently spreads more rapidly in the orchards, and since it has not the premature red spotted fruit, its symptoms are more obscure and more difficult to recognize. This makes it rather harder to handle than the yellows. The little peach occurrs mainly in Michigan, Western New York, and to some extent also in Ohio and Pennsylvania, and New Jersey.

Peach Rosette. The rosette, which occurs in Georgia and the neighboring State of South Carolina and also to some extent in Missouri and Arkansas, is still another disease of the same type. It is only interesting to Ontario growers for comparison. The affected trees produce small, very short, bushy growths, like extreme cases of the yellows, but they are so dense as to form small rosettes or bunches of leaves on the trees. The affected trees usually throw their fruit while it is still small and the trees, in fact, are usually dead by the time the fruit should ripen. Occasionally trees partially affected produce small, green, shrivelled, and imperfectly developed fruit, but it is not premature. On the healthy side of half diseased trees, which only rarely occur, the fruit is normal. The trees mostly die, root and branch, before the season is over. This rapid death of trees affected by rosette is a distinct advantage to the orchardist as the disease mostly eradicates itself.

Host Plants of Yellows Group. Peach yellows occurs mainly on the peach, but it also occurs on the Japanese group of plums sufficiently to be of importance as a plum disease. So far as we know, other plums are not affected by it. It also occurs on the nectarine, the smooth form of the peach, and on the almond and apricot. These latter are of course only occasionally grown within the range of this disease.

The little peach is known only on the peach and Japanese group of plums. It may possibly also attack some other stone fruits. The Japanese plums are so peach-like that they form ready hosts for these diseases.

The rosette occurs on the peach and on the native Chicasaw plum, and probably also on the Japanese group of plums.

Apparently peach yellows and peach rosette are native American diseases. If this is the case they are doubtless diseases of our native stone fruits just as pear blight is with the pome fruit. Rosette is very probably a disease of the wild Chicasaw plum. Little peach may possibly be a native American disease, but I very much doubt it, since it only recently appeared and the date of its appearance some twenty years ago corresponds with the introduction of the Japanese plum into American horticulture. My suspicion, therefore, is that it was introduced with the Japanese plums, but further investigations, particularly in Japan, would be necessary to determine this.

Yellows on Nursery Stock. Unquestionably yellows can be budded into nursery stock. This has been done experimentally, notably by Smith. I have done it myself in a number of cases. Naturally well-marked specimens are selected for this purpose. Nurserymen ordinarily would not bud from pronounced cases of the yellows. On the other hand, incompetent help may secure bud sticks from diseased trees; but what is more likely, buds may be cut from incipient or incubating cases which do not show the true symptoms at the time. Smith transmitted the diseases by budding from the apparently healthy side of a diseased tree. Unfortunately buds cut from yellows trees slightly affected grow fairly well in the nursery.

This is not the case, however, when pits are used from diseased trees. So far, all attempts to grow trees from diseased pits have failed. Recently I planted one hundred pits from trees well marked with yellows, with premature red spotted fruit, and 100 pits from typical cases of little peach. None of these grew. Not a single seed germinated. In all cases, so far as I know, where pits from well-marked diseased trees have been used, a similar result has been obtained. If this could be assumed to be always true, it would remove one great possibility of reproducing the disease. Unfortun-

ately we do not know what happens when pits are taken from trees only slightly affected or from incubating or incipient cases. There is then a certain amount of suspicion justifiable as to trees propagated from pits grown and buds cut in yellows infested districts. I am inclined to think that this possibility of yellows transmission has been rather overworked, however, by orchardists.

Replanting after Yellows. The trees can be replanted where yellows trees have been dug up, and they will live and bear well. This has been demonstrated repeatedly for over forty years, both in New York State and Michigan. I recall very clearly some excellent cases of this sort in the Niagara County Fruit Belt in the orchards of Dr. C. A. Ring and Mr. Jesse Lockwood. Some orchardists have combated this idea, and held the opposite opinion, but it should be remembered that replanted trees have the same opportunity to catch the disease as the original tree. In fact, experience shows that yellows causes less trouble in replanting, and the same thing is true of little peach disease, than root rot, black peach aphis, eel worm disease, or other root diseases. All of these in fact live over in the soil and cause serious trouble on the young tree set in the place of the one dug out. This is, of course, quite another matter from the yellows question.

Method of Control. In the early discussion of peach yellows around Philadelphia, mention was frequently made of destroying the diseased trees. It seems to have occurred quite frequently to orchardists that this was the proper thing to do. In the outbreak at Benton Harbor in the early seventies, it was not only discussed, but actual eradication was carried out by a number of men. The most decided step in the promotion of this method of fighting the disease seems to have been made, however, at South Haven, Michigan. A committee appointed by the South Haven Pomological Society, reporting in 1874, stated that where cases of yellows had been found in certain orchards and promptly removed, two years before, none occurred at the present time. They also brought out the point that new trees planted in the same place, were growing finely and appeared to be vigorous and healthy. They showed that it was impossible to cut off a single limb affected with the disease and that even where two affected peaches were found on the end of a limb and the limb removed, the yellows still persisted and destroyed the tree. The South Haven Pomological Society seems to have been the first Society to persist in advocating and promoting the eradication of the yellows. The results were watched with interest by the Michigan growers and were in the main satisfactory around South Haven. Other districts in Michigan have followed their example, usually, however, after being hard hit and partially or wholly wiped out before they were willing to take up the work. In New York State a great many of the better class of growers have been eradicating this disease for twenty years or more. I can cite the case of Mr. Jesse Lockwood and Dr. C. A. Ring, both of Olcott, New York, as excellent examples, also the orchard of Mr. Willard Hopkins, of Youngstown, New York. In these cases several nearby orchards less carefully handled have had serious destruction from the yellows and little peach.

Eradication Tests. About six years ago when the writer's investigations led him to the conclusion that little peach belonged to the yellows group, an eradication test was started in a definite area in Saugatuck Township, Michigan. This area contained about seven square miles, was thickly planted to peach orchards and had about one hundred and forty thousand peach trees. There was some four or five thousand trees diseased that were found the first season. A small proportion of these, however, were affected

with yellows. Three inspections were made and the diseased trees were removed with a fair degree of promptness after each inspection. The next year only between four and five hundred diseased trees were found, being only a small fraction of 1 per cent. A slight increase of somewhat over a thousand trees was found the third season, evidently due to a local outbreak in the neighborhood, but the total number of diseased trees in this area was less than 1 per cent. Only about one-fifth of these were affected with yellows, the remaining four-fifths being little peach. Similar results were obtained by the local yellows commissioners in the fourth season, which was 1906, and the orchards in this area are still standing in good condition as far as the yellows and little peach are concerned.

A similar eradication test was started by the Department of Agriculture in 1906 in an area of some six or seven square miles around Youngstown, New York, in co-operation with the Cornell State Experiment Station, through arrangements with Professors Bailey and Craig. In general it may be stated that from the eradication tests where careful records have been made over a considerable area and from the experience of the best worked orchards, of which there are a large number in Michigan and a good many in New York, it is considered that when ordinary conditions obtain, the annual loss from the yellows should be reduced to less than 1 per cent. per annum where prompt and careful eradication is done.

What is Good Eradication. We have always considered that three annual inspections, when properly made at the right time were sufficient for finding the affected trees. It need hardly be mentioned that the important thing about this work when it is really undertaken is to find the diseased trees. Their prompt removal, after being found, is a secondary matter, which is to be taken for granted . Ordinarily three inspections are sufficient. In Ontario the first one should be made in July or perhaps about August 1st; the second one should be made the latter part of August or about September 1st, and the third late in September or even running over into October. If a previous eradication has never been carried out, all plainly diseased trees should be removed as soon as they can be noted in the spring. It is always a good thing to inspect a block or row of peaches when they are ripening or about to ripen their fruit. Then the symptom of premature fruits can be utilized. It is always a good plan to have the pickers instructed to call attention to every tree with suspiciously large or premature, red spotted fruit. Orchards should be inspected tree by tree, row by row, thoroughly, regardless as to whether they are supposed to have the disease or not. In this way unsuspected cases will often be found.

It seems to me that where a severe outbreak occurs, doubling the number of inspections may well be advised. That would mean pretty nearly an inspection about every two weeks from the first of August. It certainly is advisable to make a very late inspection in October so as to prevent, if possible, the disease carrying over another year.

The orchardist or inspector is often puzzled over a doubtful case. He dislikes to condemn a tree for removal unless certain that it is diseased. To my mind, however, the real doubtful cases which are not plainly caused by some other disease or injury should invariably be removed. One is certainly taking chances of leaving infection behind when he leaves these uncertain cases. It should always be borne in mind that the removal is done for the benefit of the healthy trees left behind.

Inspection Laws. Undoubtedly the best results are to be secured in districts where every orchardist will be his own inspector. No outside man

can more quickly and accurately detect this disease than a peach grower in his own orchard. He knows the appearance of the trees on every different piece of land, soil, type and exposure, and keenly recognizes and watches any change of symptoms which could be attributed to the yellows. On the other hand, it is absolutely necessary, to secure good work in a community, to have official inspectors. The reason for this is that many growers, although constantly in the presence of this disease, do not learn to recognize it in its early stages, especially when the trees are not in fruit. Furthermore, there are a good many trees in gardens or by the roadsides or otherwise out of commercial peach orchards that would receive no attention. To secure proper uniformity, therefore, some sort of an official inspector, no matter by whom paid, should be employed. The smaller the unit, the better. The less territory an official inspector must cover, the more thoroughly he can be expected to accomplish his work. As a matter of fact only a few orchardists in my experience have ever done strictly first-class work in eradicating the yellows. Many orchards otherwise well cared for by progressive and enterprising growers are still somewhat neglected in this regard, and it is a question in my mind whether the recent severe outbreak in Southern New York and Connecticut cannot be to some extent attributed to carelessness on the part of the growers. I have been through these States every summer for the last four years and have been surprised to see the yellows left so commonly scattered about.

Disposal of the Diseased Trees. A word in conclusion as to what to do with the yellows trees after they are found. The main thing, of course, is to find the diseased trees, but when they are found, with our present lack of knowledge about the disease, we feel that the only safe way is to dig the tree up or pull it up with horses and destroy it by burning. Perhaps the very safest way of all is to bring dry wood into the orchard and burn the tree on the spot or in the center of the colony, if there are several trees, without dragging it out. As a matter of fact, however, there has been so little unsatisfactory experience as to make this seem an extra precaution. Possibly it might be advisable to pull the trees up and let them wilt or dry out before removing from the orchard. At any rate, there seems to be abundant evidence that a dead peach tree, though it may have had the yellows, is not dangerous in transmitting the disease. Never cut the tops off of yellows trees and leave them standing. Such trees may still sprout out new growth and from the yellows standpoint are still in action. Kill the tree, root and branch, at any rate. Many orchardists wish to use their yellows peach trees for fuel, and, while this is not supposed to be absolutely safe, I have seen good results in many cases where this was done.

Summing up, therefore, I should say that if you wish to be extra careful concerning infection, burn the tree at once, but if the tree is promptly pulled out and allowed to dry you have probably done all that is possible in killing the disease.

Above all, the best advice I can give you is to pull out and destroy every peach tree in the Province which shows the slightest symptom of the yellows next season. If this is carried out, especially if repeated for two or three seasons in succession, all the previous history and experience connected with this trouble points to success in bringing this malady under control. New orchards can then be rapidly planted out and the peach industry renewed under more favorable conditions than ever.

It is ordinarily necessary to take fairly good care of the orchard, at least to give it fair cultivation and fertilization, in order to tell diseased trees. If trees are weak and sick from nitrogen starvation, growing in

uncultivated and neglected weedy orchards, it is often times impossible to properly inspect them. On the other hand trees over-stimulated with fertilizers, especially nitrogenous manures, may fail to show the yellowing or leaf symptoms promptly.

THE COMMERCIAL STATUS OF OUR STANDARD VARIETIES OF FRUIT.

Apples.

W. H. Dempsey, Trenton: The district I represent comprises the eastern part of Hastings and the Counties of Northumberland and Prince Edward. Among the fall apples in our section of country, Duchess stands first.

Gravenstein is not doing as well as Duchess, but can be grown over a larger area than at present. Alexander comes next, and wherever I have observed it growing, it is doing remarkably well. Then comes Fameuse and McIntosh Red. Wolf River does remarkably well all through the eastern part of Hastings and Northumberland and Prince Edward. Buyers have apparently lost sight of the fact, however, that it is a later fall apple than Alexander, and it is being picked too early in our district. Ribston Pippin is another fine variety. Blenheim I find very successful. In some sections it is one of the most productive varieties; in other sections it is not so productive. Soil and atmospheric drainage seem to have a great influence on it, but where it can be grown, it is a very profitable apple. Greening is doing very well. Seek-no-Farther is doing remarkably well in many locations. Nonsuch is one of the best for light limestone gravel, producing large, fine apples in abundance. Spy is doing well wherever there is good atmospheric and soil drainage. Baldwin seems to be a sectional apple, like Blenheim. Adjacent farms will sometimes not produce Baldwins equally well, but where it can be produced, it is one of the best.

Golden Russet on certain clay soils is doing remarkably well, and also on a few of the sandy loams. Cranberry Pippin does well in special locations, producing as heavy crops as any variety.

The varieties mentioned comprise fifteen that all do well in the district in which I live, and all are of good quality with the exception of Cranberry and Baldwin, the quality of which I would not place as high as the others.

As to their susceptibility to fungus, canker and pear blight, Duchess has a small amount of fungus, and I have found some pear blight on it, but not much. Gravenstein I find quite subject to canker in some locations. Alexander is slightly subject to canker, and there is some blight on it in some sections. On McIntosh, I find but little canker, but the fungus is bad, as it is on Fameuse. Wolf River has been fairly free from this pest, so far as I have observed. Ribston Pippin will canker some, and so will Blenheim. Greening, Baldwin, Spy and Seek are probably as bad as any on the list for canker. I have found both canker and blight on Golden Russet in some sections.

Q.—Are any of these varieties so subject to spot or scale that they should be eliminated?

A.—No, none of that lot; we can thoroughly control scab with Bordeaux mixture.

Q.—Is there any apple on which scab is so difficult to control that the variety ought to be eliminated?

A.—McMahon might be so classed.

Q.—It is not worth keeping anyway.

A.—No. I find the Spy extremely bad in some locations; also Greening and Baldwin.

I should like to mention the fact that I am continually receiving enquiries about worthless varieties which we have been condemning for years, because some agent takes hold of them and recommends them. For instance, Longfield; we find quite a number growing in Hastings, Prince Edward and Northumberland. These orchards have been very difficult to sell. Longfield, Scott's Winter, Bismarck and Lawver should not be planted in our section. Also Ozark, which is nothing more than Gano, or Black Ben Davis.

Q.—What do you think of Wallbridge?

A.—I would not recommend planting it in our district.

A MEMBER: Or in any other.

PEACHES.

J. L. HILBORN, Leamington: While we grow some of the same varieties of peaches in the Essex district as you do in Niagara, there are many varieties, which you grow largely, of which I cannot speak definitely of my own experience. I will give you a list of the varieties we are chiefly growing. I have left out white peaches, as I think all will agree that yellow varieties are more profitable for us.

The Triumph we are ceasing to plant. The tree does not do well with us after it is six or seven years old. By keeping it heavily pruned and well thinned, we get a fairly good crop for its season, but Dewey being about the same season and a much better peach, we are ceasing to plant Triumph. Dewey is also subject to rot, but not so much so as Triumph; but as the trees get to be seven or eight years old, we find them rotting somewhat. That was the great trouble with Triumph.

St. John does very well a little north-west of me, where the soil is a trifle heavier, but it is subject to some fungus disease, and the fruit appears to be stung by curculio. The tree also exudes gum in many cases.

Garfield does splendidly with us and is very free of all disease, but a rather shy bearer. It would be the best of its season if it bore more.

Bernard used not to be very clean, but since we have been spraying for other troubles, it has been growing very fine fruit. By keeping the trees well pruned and well cultivated, we get fair size and nice clean fruit.

Crawford: What few peaches we get are nice, but we get so few that we are ceasing to plant it. Fitzgerald is much the same.

Engol Mammoth is the best peach of its season with us, being very free from blemish, bearing regularly and not requiring much thinning. New Prolific ripens about the same time and is pretty nearly as good. It does not grow quite so large, but is productive, and free from fungus trouble.

Elberta comes in just after it. It does not grow so rugged with us as on slightly heavier soils, and does not bear well on an average. It is very susceptible to curl leaf, but as we have to spray for other things and the curl leaf is so easily controlled, I do not think it should count very much against it.

Kalamazoo: I think I was the first to introduce this variety in our section, and I do not know if you in the east are acquainted with it. It should be classed along with Engol Mammoth in its season, or perhaps about

a week later, and it is the best peach of its season. It grows very clean, and its fruit is particularly free from blemish. There are very few culls. It does not color quite as well as Engol or Crawford. It is a good size, and we have difficulty getting three rows in the basket. It sheds more fruit than any variety I know of, and even then it usually requires some thinning.

Longhurst, Hill's Chili and Wager are disappearing entirely on account of fungus. Kalamazoo is entirely replacing them, being about the same season.

Q.—Is it as good quality as Longhurst?

A.—I think it is better.

Q.—It cannot be better.

A.—Well, not better for canning purposes. They say Longhurst, if you get it full grown, is a splendid canner, but it is not as profitable on the market as Kalamazoo.

Q.—Do you find it a larger peach?

A.—Yes, on an average, and it runs very even in size.

Crosby comes in after that. It does well with us. By keeping the trees fairly well pruned, thinned and sprayed, it grades a satisfactory size, and the quality is good.

Banner is one of our best peaches, but it is hardly as free from fungus as some, but nearly so, nor is it as even in size as some; it bears heavily.

Golden Drop is a few days later in most seasons. It grows very clean and nice as a rule, but in wet seasons there is a little fungus.

Lemon Free is a good canning peach, and does well, but is not as attractive for the market as some others. It is very hardy, and a great bearer.

Smock is not grown as much now as formerly. The tree is inclined to split and break down when there is a heavy crop. Banner is taking its place.

Salway is not planted to any extent on account of late ripening, although in some seasons it does well. This year it sold as high as any variety.

Pears.

W. F. W. Fisher, Burlington: There are a great many varieties of pears, but only a few have been thoroughly well tested for our district. Our plantations of late years have been confined largely to Bartlett, Standard, Dwarf Duchess, and the much despised Kieffer. A grower wishing to extend the season would probably plant Wilder, Giffard or Lawson, and Boussock. Boussock we have not tested commercially, not having had it long enough to say as to its merit, except that it has good quality and fine appearance. The most delicious pear we have is Sheldon, but it does not hang on the tree sufficiently well in many seasons to be profitable.

Q.—Does it bear well?

A.—Yes, with age, and it has this to recommend it that it will get age, which is not the case with a good many varieties.

Q.—What about Boussock in respect to blight?

A.—It is very free from blight. I would recommend it for a young man to plant, as the tree will live as long as he will; but it is late coming into bearing.

Q.—What about Anjou?

A.—It has good quality, is a good grower, but a shy bearer in most instances. It also with age and on a heavy soil will, I think, bear well.

Q.—Do you recommend Clairgeau?

A.—It is a much better bearer, and of much poorer quality. It may be presumptuous for me to differ with some authorities on the subject of pear blight, but I think that some of the precautions advised are quite unnecessary. You might as well kill a man as scare him to death. I do not agree as to the necessity of sterilizing pruning implements and that sort of thing. I have made experiments. I have cut off limbs having the worst cases of blight, and then, with the same saw, have cut off healthy limbs on healthy trees, and have never known a case in which the bacilli were transferred to healthy trees in this way. I think it is wise to paint large limbs where cut in pruning as a precaution against blight, and in order to keep the weather out and render the tree immune from diseases that might enter through large wounds.

Q.—What do you think of Howell?

A.—An excellent pear of good appearance and fair quality.

Q.—What is the most susceptible pear to blight?

A.—Clapp's Favorite. I have a few rows running across my orchard with Kieffer on one side and Boussock on the other. Clapp's Favorite have been very full of blight, but it has not been transferred to the varieties on either side. Bartlett is very subject to blight, but still very profitable. Planted 15 feet square, you get 200 to the acre, and even at a low price, they will show a profit. With dwarfs we get practically 400 to the acre, and with the trees yielding about half as much of a crop, we get practically the same result.

Q.—With trees subject to blight would you recommend keeping the land poor or having it rich?

A.—If you keep your land poor and do not prune your trees, they will not blight so much, and they will bear a lot of inferior fruit. I would rather take chances of cultivation, get a few crops of nice fruit and then take the trees out.

Q.—Don't you think that less nitrogen and more potash might be beneficial?

A.—I don't know; I am not acquainted with the use of commercial fertilizers in a large way.

Q.—Manuring with barnyard manure and rapid growth on wet land would make trees susceptible to blight.

A.—I agree with you.

Plums.

E. D. Smith, Winona: Plum growing during the past season has not been very profitable, and on that account is perhaps of not as much interest as some other topics. It is, however, one of the main industries in the Winona district, and about a hundred thousand baskets have been grown and sold there in each of the past two seasons. The lowest price this year was 15c. a basket of 11 quarts. That is a very low price, but even at that, while there is perhaps no profit to the grower, there would be no loss. It looks to me as though this season represents the worst that can come to plum growing for many years. There are many reasons for this. Last year there was a heavy crop, and from 50c. to $1 per basket was realized. On account of the high prices paid by the canners, they were unable to profitably dispose of the season's output, and this year they did not want any plums practically. Thus, one of our best markets for plums, the one that last year took practically all, was absent. In addition to that, times were the worst for many years, and the demand was not good except at very low prices. But in spite of that, the whole crop moved off at prices that left a slight margin of pro-

fit. They were all sold, and I can remember years when a considerable portion of the crop remained on the trees. The canners will require some plums another year, and I think we may look for some improvement in trade conditions. Then there are a number of old orchards in our section that have been planted fifteen or twenty years and cannot bear much longer, while there have not been many plums set out for some years past. A year ago last spring I set out two or three thousand plum trees, and if I had suitable land, I would not be afraid to plant to-day.

Q.—What varieties?

A.—I would not plant Abundance. There is a large number of these trees over the country. A gentleman said here yesterday that he would plant Abundance; the variety has gone out in our section. I would plant Burbank; it is a heavy bearer and good shipper, and is fairly good quality. It has so many good all round qualities that I would plant it. Lately we have been planting more late plums. Years ago we would have planted Washington, but would not do so to-day. As time goes on we discover many new varieties of plums that supersede to a large extent those planted years ago. Hudson River Purple Egg is a favorite of mine. It is a strong-growing tree and a good bearer. The plum is of good size and color, and a good shipper. I think it would be all right for anyone in Southern Ontario where plums are grown successfully. I am speaking particularly of the district where there is a large shipping industry. We must look to distant markets as we have pretty well occupied Ontario, Quebec and the Maritime Provinces. We can reach all this country by express, and a good deal by freight. We now have to reach out to the North West market, which is expanding at a tremendous rate. By selecting good shippers, we could lay our plums down there by express, if we had reasonable rates, and could take the whole of that market when plums were cheap.

Reine Claude is the variety planted most largely in our section. It is not only a good shipper, but is in demand by the canners at all times. It is of choice quality, a heavy bearer, but somewhat tender perhaps.

Of the newer varieties, I would plant Monarch. It is a fine, large, blue plum and a heavy bearer. It comes into the market after the glut of Lombard is over.

Grand Duke is a large, fine plum, and a heavy bearer, but not as good a shipper as Reine Claude or Hudson River Purple Egg.

Q.—Would you plant any Lombard?

A.—I think the time is approaching when Lombard should be planted. I would advise planting some.

Q.—Empire?

A.—It is a good plum, but the tree is not a strong grower.

Q.—Lowrey's Gage?

A.—We introduced that variety; it is extra early, but does not bear well now.

Q.—Imperial Gage?

A.—It is inclined not to bear well. It bears almost every year with me but not heavily.

Q.—The Dawson?

A.—There is a demand for a certain quantity, but I think the market could be easily overstocked. It is an excellent shipper.

Q.—Is not Archduke and Grand Duke the same plum?

A.—Practically the same.

Q.—Would you plant Prince of Wales?

A.—It is a handsome plum, and very desirable, much handsomer than Lombard.

RESULTS OF ORCHARD SURVEY WORK IN NEW YORK STATE.

By Prof. Chas. S. Wilson, Cornell University, Ithaca, N.Y.

The subject I am presenting is a new line of work which has been started in the states and which has proved one of the most valuable and practical works ever done in orcharding.

I feel that this work is connected more or less closely to the interests of the fruit growers of Canada. In the first place, the work has been done in the counties of New York State bordering on Lake Ontario, counties which are neighbors of your Canadian Dominion. In the second place, the work was suggested and begun by one who formerly was a member of this Association, who was born and brought up within your borders, and who is known and loved by many of you, Prof. Craig.

In the summer of 1902, at a meeting of the New York State Fruit Growers' Association, held at Olcott Beach, Prof. Craig suggested that it would be an important part of the work of a Fruit Growers' Association to take up a definite study of the orchards in the leading fruit growing sections. The executive committee was keen for the project, but had no funds at that time to carry it out. In the winter of the same year, Prof. Roberts, who was then Director of the Cornell Experiment Station gave the necessary authorization and funds and the work was begun.

The word survey may be somewhat misleading. It does not mean, as the word might convey from the Civil Engineer's standpoint, the accurate measurement and the number of acres in the orchard, their location, etc. It means more than that. It means that a detailed record and history of the operations and products of that orchard for a period of five or ten years. Reference to the blanks which I have passed about will give you some idea of the work, and if you will refer to these, I shall try to explain to you how the work is performed, the tabulations made, the accuracy of the results and their value. In the first place, the work is done by a surveyor, so called, a graduate student of the College of Agriculture, who has taken his work in Horticulture. This surveyor visits personally every orchard in the county or state and takes records of the different factors entering into its production. For example, in the case of the soil management factor, the surveyor will secure information from the owner as to how that orchard has been managed for the past ten years. Has it been tilled for ten years? Has it been in sod? Or is it tilled part of the time and in sod part of the time? If it has been tilled, how often each summer is the work done? If it has been in sod, has it been pastured with hogs, or with cattle, or with sheep, or not pastured? So, in the case of the spray, data is secured relative to the mixtures which are used, the number of applications, the machinery, the effects of the spray, etc. Detailed records are made of each one of the different factors which are represented on the blanks, and then, most important of all, a record is taken of the yields and prices per bushel. The practical value of the work depends upon a comparison of the yields and income. It is important, therefore, that data relative to these be secured. This data is taken for five years back.

After the surveyor has visited all of the orchards in the county, the work having been done in the summer when orchards could be best inspected, that is during August and September, the records are brought to the office and tabulated. The tabulation is done in this way. For example, let us take the tillage factor, we divide the different methods of tillage somewhat as follows:—

Tilled ten years or more. Sod three years at least.
Tilled five years or more. Sod five years or more.
Tilled three years at least. Sod ten years or more.

Then we take the records of all the orchards which have been tilled ten years or more, putting the number of such orchards in one column and the number of acres included in these orchards in another column. We add the yields of all the orchards and divide by the number of orchards. This gives us the average yield of an orchard under that method of treatment. The same for the income, this gives us the average income per acre. We do this for all the different treatments under this one factor which gives us our tabulation on the basis of average yields and income in such a manner that we can compare side by side the real results the fruit growers are securing under the different treatment. We do this for all the different factors and make out our tabulation in the same way.

Now the question of the accuracy of these results is one of great importance. One might think that inasmuch as some of the records given by the fruit growers are estimates, that these estimates would make the result of the survey inaccurate, but this is not true. Of course some of the records of the yields and prices are estimates, but usually the grower knows definitely for three years back and can estimate closely for the other two years. Often when we have several estimates, the net average gives us accurate figures. The orchard survey is built up on the law of averages, and the law of averages, when a great number of orchards are considered, is accurate. Let me give you an example to show how accurate these averages are. One of the men at the College was presenting the surveys at a meeting, and he wished to impress upon the minds of the members the accuracy of these averages. In order to do this, he brought into the meeting a number of slips of paper on which were struck off a single line of the same length less than an inch in diameter. He distributed these slips of paper and asked the members to guess on the length of that line. There were 30 guesses made, varying from a minimum of ¼ of an inch to a maximum of one inch with all intermediate lengths. These guesses were averaged and the average of the 30 guesses gave him .723. He had measured the line before coming into the meeting and the nearest measurement he could make was .72 inch. Thus the average of those 30 guesses gave a more accurate measurement of that line than the measurement itself. Now in our orchard survey work, we are dealing not with 30 surveys, but with hundreds of surveys, many of which are definite, only a few of which are estimates; hence, our results must be accurate.

And now for the results which we have secured. I wish to state that there are four factors concerned in the good care of an orchard, tillage, pruning, fertilizing, spraying, which are important to the good management of that orchard and none of which ought to be neglected. I shall give you this morning only the results which we have secured from the orchard survey work on tillage and spraying. Do not conclude from what I shall say that these are the only two factors. The others are equally important. Below are given the results of tillage:—

Five year average per acre	All Orchards.				Well cared for only	
	Niagara		Orleans		Orleans	
	Bush	Value	Bush	Value	Bush	Value
Tilled ten years or more	280	$120	327	$182	337	$189
Tilled five years or more	254	100	274	138	296	148
Tilled at least three years	239	97	225	113	234	121
Sod at least three years	209	67	222	107	242	118
Sod five years or more	197	76	204	108	258	134
Sod ten years or more	194	75	176	87	232	117

Let us see what these figures teach us. If we look at the figures for Orleans county, we see that in the case of all orchards, those that were tilled 10 years or more, gave 86 per cent. larger yields than those which were in sod ten years or more, and those which were tilled 5 years or more gave 34 per cent. larger yields than those in sod 5 years or more. In the case of the orchards well cared for, only those which have been tilled ten years or more give 45 per cent. larger yields than those in sod 10 years or more, and those tilled 5 years or more 15 per cent. larger yields than those in sod 5 years or more.

Another interesting thing is shown by this table. We often hear the question discussed, are apples grown on sod better than those grown on cultivated land. The answer is generally given in favor of the sod apples because of their higher color and early maturity. As a matter of fact, buyers have been paying more for those grown on cultivated land than for those grown on sod. If we look at the figures of Niagara county, we find that for those grown on land tilled 10 years or more, the average price per bushel is 43 cents. Those grown on sod 10 years or more, the average price is 38 cents. In Orleans county, the average price of tilled apples is 56 cents per bushel, and the sod apples 50 cents per bushel, or in other words buyers have been actually paying 15 cents to 18 cents per bushel more for those grown on tilled land than for those grown on sod. Whatever the opinion of the fruit grower and the buyer, the facts shown by these figures cannot be denied.

But all orchards are not tilled, and it would not be good for all orchards to be tilled. As a matter of fact only about 5 per cent. of the orchards of these counties are tilled year after year, where 20 per cent. are in sod year after year. But while some orchards in sod are given this treatment, there are others not pastured at all or pastured with cattle or sheep or hogs. The results of our surveys comparing these different methods of treatment are interesting. We have them for three counties, Niagara, Orleans, and Wayne. They are given below:

Three Year Average per Acre.

Pastured with	Niagara	Orleans	Wayne
Hogs	138	312	271
Sheep	129	308	216
Cattle	117	153	159
Not pastured	141	217	185

What do these figures show us In the first place they all show that the orchards pastured with cattle give poorer returns than those not pastured at all. The reason for this, I think is evident. The cattle run against the trees and break the bark and the branches and browse the bark and branches as far as they can reach and do considerable damage. The little expense which would be incurred in securing pasture elsewhere will be saved many times over by preventing the injury to the trees. If growers have cattle and no place to pasture them, turn them into the roadside. Sheep, we see, give better returns than no pasture at all. The reasons are again evident. In the first place sheep receive most of their feed outside of the orchard and the manure dropped is a constant addition to the humus and fertilizer. In the second place, sheep graze grass close to the ground, preventing excessive evaporation from the surface on the blades of the grass.

Hogs give the best results of any kind of pasture. As in the case of the sheep, hogs receive most of their feed outside and the manure dropped adds to the fertilization. Hogs eat the apples which fall early in the summer, which apples fall because they are wormy, and thus hogs do a great deal of good in destroying insects.

Again, most important of all, the hog pastured orchard is really a cultivated orchard. If the hogs are allowed to root, they break and turn over the sod under the trees wherever the apples are, and in the course of two years will have completely turned over the sod of the whole orchard. This is cultivation, which differs only in the kind of machinery. In the one case the machinery is the hog, in the other case the machinery is the cultivator. The comparison of this table with the one preceding is interesting. We see that although hogs give the best results, often these results do not equal the results of tillage. As a matter of fact, 70 orchards in Orleans county, which were pastured with hogs and sheep only one in five gave yields equal to the average yield of the tilled orchard. And an orchard in order to be successful ought not to be equal to the average but above the average.

I do not want you to think that I believe that all orchards ought to be tilled, as the tables might indicate. It is impossible and impracticable to till all orchards, because some might be on soil which could not be tilled, or might be on hillsides where tillage would be impossible or not advisable. Again, some of the sod orchards pastured with hogs or mulched will give results, which considering the expense of tillage, will be better than the results from tillage of the same orchard. Our work, however, enables us to say that taking into consideration the expense of tillage, extra cost of barrels, labor, handling, etc., four-fifths of the orchards which are now in sod in these counties would bring up the net results if they were tilled.

Our tabulation on spraying is given below:

All Orchards.

——	Niagara.		Orleans Co.	
	Bushels.	Value.	Bushels.	Value.
Unsprayed	261	$ 45	245	$ 92
Sprayed once	364	93	307	116
" twice	509	101	343	127
" 3 times	577	171	322	139
" 4 times	590	183	569	211

Well Cared for only.

——	Niagara.		Orleans Co.	
	Bushels.	Value.	Bushels.	Value.
Unsprayed	266	$ 95	328	$103
Sprayed once	353	146	346	139
" twice	422	147	374	143
" 3 times	440	201	414	184
" 4 times	285	226	569	211

This table shows us, considering well cared for orchards only, that those in Niagara county which were sprayed four times gave more than twice as much income per acre as those which were unsprayed, and in Orleans county we have the same results. It seems to me that this proves without the shadow of a doubt the beneficial results of spraying.

To conclude, these are not experimental figures. They are the results of a comparison of the results the fruit growers have obtained in the last eight or ten years in their orchards, whatever their methods of treatment. The figures are astonishing, scarcely believable, and yet they are facts. We cannot doubt their accuracy.

As I said before, there are four factors entering into the good care of an orchard—tillage, spraying, fertilizing. pruning. No one of these ought to be omitted. In some cases one might be omitted without seriously affecting the results, or perhaps one might replace another. For example, tillage might take the place of fertilizing, or we might use fertilizing instead of tillage. Often a grower receives good results from one of these factors and he immediately becomes convinced of the importance of this factor and makes it a hobby and loses sight of the others. Such practices are wrong. A proper balance must be maintained between all four of these factors if the fruit grower is to be successful. If he maintains a proper balance, he will be successful.

Q.—Which will do best in an orchard, hogs or sheep?

A.—Hogs, I think.

A MEMBER: I do not think so.

Prof. WILSON: Hog pasturing is practically cultivating the orchard, and if you must have orchards in sod, pasture with hogs. My father's own orchard at home, of about 20 acres, has not been plowed in my memory, and every year he has taken an excellent crop of apples by pasturing two or three hogs per acre. Father believes in tillage, so do I, but I believe in letting a good thing alone.

Q.—I know of an orchard that was ruined by pasturing with hogs.

A.—They may have had too many hogs. I have never seen any injury to the trees from two or three per acre. They will root in spots under the trees that have fruit on that year. In about two years all the trees will bear, and in that way they will all be cultivated.

Q.—I have noticed that the holes they make become filled with water, and this has a tendency to sour the land on heavy soil.

A.—I do not know how it would be in this section, but I do not think it would hold with us. In New York State nearly 20 per cent. of the orchards are pastured with hogs, and I have never seen any serious injury to trees.

Mr. HAROLD JONES: I know that injury is sometimes done when small orchards are over pastured—particularly with brood sows and their litters. In such cases I have known them to strip the main roots. Avoid that, and there is no danger.

A MEMBER: That is the experience also with us.

Prof. WILSON: That may be true. We feed the hogs in a pen outside the orchard, and then let them run in the orchard. We do not ring them as they will do more cultivating without. The table shows, however, that even when hogs are pastured in sod orchards, the result is not quite equal to tillage.

Q.—How would it do to keep the orchard tilled for two or three years; then let it go to sod for a year or two, and while in sod pasture with hogs?

A.—It would be an excellent scheme.

Q.—Would it answer to cultivate around the trees and leave the rest in sod, and allow hogs to run all summer?

A.—The roots go far beyond the ends of the foliage. If there is a method of sod management equal to tillage, we have not found it out yet. In Orleans, of the seventy orchards in sod, fourteen of these, or only one in five, gave a yield equal to the average of the tilled orchards, and an orchard to be successful must yield better than the average.

Q.—Do you believe in shallow or deep cultivation?

A.—If you were starting to till a sod orchard you would have to begin with shallow cultivation; you might have to begin with a disc harrow. Shallow tillage is better than deep tillage unless the roots are already down. Do not cut too many roots; it will do no harm to cut a few. If the orchard has been in sod the roots are near the surface.

Q.—How late do you cultivate?

A.—Do not cultivate after the middle of July, then use a cover crop of rye; vetch and clover seed cost too much.

Q.—Do you consider rape as good as rye?

A.—I have seen rape only in a few cases.

A MEMBER: Rye grows when the crop is not growing.

Prof. WILSON: Do not allow the orchard to remain bare during the winter; keep a cover crop on, buckwheat, rye or something.

Q.—On what dates do you spray?

A.—First with Bordeaux mixture and arsenate of lead just before the blossoms open; again with the same mixture just after the blossoms fall; a third time two weeks later, and a fourth time later than that, to be determined by weather conditions and insects.

Q.—Would you recommend an earlier spraying when the leaf bud is opening?

A.—For the bud moth? The bud moth is not serious with us, but I would recommend an earlier spraying where it is bad.

Q.—I notice your figures show a smaller return from four sprayings than from three sprayings?

A.—I cannot explain that. The average per tree was greater.

Q.—Do you really believe the figures indicate the result.

A.—I do not, but I cannot find the error. The surveyors commenting upon the discrepancy said that the difference in price was due to the high quality of the fruit: but I do not believe it could have brought so much of a higher price, because the average yield is almost 200 bushels more per acre, but the average income per acre overbalances that.

Q.—It is entirely different in the next column?

A.—Yes, when we take our tabulation for the well cared for orchards only. If we compare the income from the sprayed and the unsprayed orchards, there is certainly a great difference whether or not one may believe in spraying once, twice, or three times. These figures show what growers are actually getting and have got for the last ten years, and you can decide for yourselves how many times you think it best to spray.

Q.—Are bees necessary in an orchard?

A.—They are a great help, and I should advise the fruit grower to keep bees in the orchard if he can.

A MEMBER: Last year I put in a few hives, and this year the crop has been twice as much as last, although I sprayed more this year.

Q.—The last figures of the chart would show that spraying is everything?

A.—No, I do not think so. Sometimes one of these four factors—pruning, fertilizing, tillage and spraying—may be omitted without serious injury, but it is not well to do so, when perhaps one may replace the other to a certain extent. For example, we may till our orchard to take the place of ferti-

lizer, or we may double fertilize to take the place of tillage, but can the fruit growers of New York afford to do this? The mistake commonly made is this: one grower will get good results from tillage alone; tillage at once becomes his hobby, and he forgets the other two factors. Do not omit either factor.

Q.—Have you ever seen any bad effects from spraying?

A.—Yes, a few years ago we sprayed as an experiment to determine injury from Bordeaux spraying, and we got it. We had sprayed twice, and went back to spray a third time, but found that two-thirds of the foliage was on the ground. We got injurious effects from using formulas as strong as recommended here yesterday. The formula recommended here yesterday for apples was about 5-5-50. We got serious injury from that. We find that a 3-3-50 mixture will control fungus just as well and cause no injury.

Q.—How much lime?

A.—We use 3 pounds copper sulphate, 3 pounds lime, and 50 gallons of water.

Q.—If you increased the proportion of lime, would you still get injury?

A.—We got injury all the same where we increased the lime.

THE SHIPMENT OF EARLY APPLES AND TENDER FRUITS TO GREAT BRITAIN.

By J. A. Ruddick, Dairy and Cold Storage Commissioner, Ottawa.

I want to lay before you some information collected during the past season in connection with the shipments of early fruit to Great Britain. This subject may very properly fall under three heads: First, is there a market in Great Britain for our early fruit at remunerative prices? Second, if so, can fruit be landed there in good condition? Third, will it pay growers to make an effort to secure that market for this class of fruit in place of others they may have now?

Early this fall before the shipping season began, I was authorized to announce an arrangement with two steamship companies for the reservation of cold storage compartments on certain steamers, for the carriage of fruit only. Shippers were invited to use this space, with the understanding that whatever dead space there might be would be paid for by the Department. We arranged for space on four steamers sailing for London. The reason we selected that port was because we wanted to make a succession of small shipments of fruit for the Franco-British Exhibition, and thought we could work the two things together. We made no arrangement for any other port. We gave no guarantee as to temperature. It was simply an offer of the accommodation required by shippers of this class of fruit. In the past the trouble has been that when a man wanted to ship, say, a carload, he was unable to get the right accommodation. The smallest cold storage chambers contain about 2,000 cubic feet of space. On some lines the smallest ones measure about 4,000 cubic feet. The quantities of fruit available for shipment have been so small that it has been a case of paying for a large amount of dead space, or accepting an unsuitable temperature in order that other produce might be carried in the same chamber, neither alternative being satisfactory to the shipper.

Q.—Was there a man along in charge?

A.—No, it was left entirely to the steamship company. The only precautions taken were to see that the fruit was inspected,—the loading was watched by the cargo inspectors, and a thermograph was placed in the chamber. Then we had a special report by our cargo inspector at London when vessels arrived.

The correspondence I have before me from receivers shows, on the whole, that there was quite a good demand—that they liked the fruit, and wanted more of it. Some shippers complain in many cases that the returns were not sufficient to encourage them to make further shipments.

Here is a report on a carload of pears, consisting of 1,194 boxes, shipped to Glasgow. The net proceeds amounted to only 32 cents a box, the freight being about 25 cents, and the other charges, which all consigners of fruit understand, amount to £29 on that one carload. The commission merchant speaks highly of the shipment, and asks for more.

Q.—Were these pears shipped to commission houses or to some private agent?

A.—They were shipped to a well known, and, I think, reliable commission firm in Glasgow. The highest price received for these pears was 4/9 per box.

Q.—What variety?

A.—Anjou. For Kieffer, 2/9 was received. In another shipment Clapps brought 5/, and Bartletts 7/6.

Most of the dealers emphasize the fact that it is important to wrap the early fruit. Being early in the season, it is apt to be warm weather when they are landed, and consequently a great deal of moisture condenses on the fruit when it is taken out of the cold storage chamber. Wrapping helps to avoid the damage from this cause.

Q.—Mr. R. Thompson's pears were wrapped, and they did not bring good returns either.

A.—A good deal depends on the kind of market they happen to strike, as well as the condition of the fruit.

Q.—Were these goods all sold by auction?

A.—I presume so. James Adams reports, "Your apples were not only good, but finely packed, and we would like regular shipments.

Q.—Were they boxed?

A.—Yes. Every receiver who reported, except one, emphasized the importance of having dessert and early apples packed in boxes.

It is difficult to make actual comparisons, or to show how much better price has been obtained for cold storage apples, and this is important to the shipper. Of course, it is all a matter of the condition of the fruit. It is quite possible that fruit carried in ordinary temperatures might land in better conditon than other fruit carried in cold storage if the cold storage fruit was out of condition when it was placed in the chamber. That is what often happens.

Losses sustained by shippers arise largely from the fact that the fruit arrives in an over ripe condition. In a season like the present one has been, with extremely hot weather continued through September and a good part of October, such losses are heavier than usual. Cold storage delays the ripening of fruit. and if it had been applied properly to certain shipments this year, the gain would have been very large indeed. We have been at some pains to collect information on this point, by studying the reports of sales in conjunction with the reports of our cargo inspectors on the condition of the fruit both at Montreal and at ports in Great Britain, and we have fixed the loss during a certain period at about $1.50 per barrel—a loss which would have been largely avoided if these apples had been shipped in cold storage.

I make this assertion: that every sound apple grown in Canada, if picked at the proper time, could be delivered in Great Britain in perfect condition if proper use was made of cold storage.

Between September 17th and October 3rd, the steamships "Ottawa," "Virginian," "Pretorian," "Marina," "Athenia," "Hesperian," and "Lakonia," carried 58,664 barrels of apples. Taking the proportion of these shipments which sold at a reduction in price owing to bad condition, and we have a total loss of something like $50,000, or enough to pay for a lot of cold storage. Of course, these vessels sailed during the hot, smoky weather, when there was much delay in getting out of the St. Lawrence. The ventilating systems fail in such emergencies, because the outside air is too warm to cool the fruit when circulated through the holds.

As to the fruit at the Franco-British Exhibition, Commissioner Hutchison reported on it under date of October 26th, as follows:—

"On the 5th of September, we received 26 cases of new crop apples and 35 more on Saturday, September 12th. On September 18th, we received a small consignment of 17 cases of assorted fruit, among which were 3 boxes of "Bartlett" pears called "Williams" here, and a box of peaches of the "Crawford" variety. On October 5th, we received a shipment of 151 cases of assorted fruit, consisting of 61 boxes of apples, 24 boxes of pears, 60 boxes of peaches and 7 crates of grapes. You will be pleased to learn that all this fruit arrived in perfect condition and was remarkably well assorted and packed. The Elberta peaches have certainly made a record. Some of the peaches have been for ten days on plates in the exhibit without showing any signs of decay."

The report goes on to state that sample packages of peaches and pears were sent to commission merchants and dealers in London. One box of 33 peaches sent to Geo. Munro, Limited, netted $3.65. Another box which went to Wm. Brooks & Sons, fruiterers, of Regent St., netted $2,43 for 30 peaches. Averaging the two boxes, the wholesale price received was nearly 10 cents per peach after paying the commission. It is reported that peaches of about the same size were selling in London at 1s. each retail at that time and pears were selling at 2d to 6d each.

The following letters were received by the Exhibition Commissioner from Geo. Monro, Limited, of Covent Garden Market:

October 13th, 1908.

Secretary Canadian Government Exhibition,
Franco-British Exhibition,
Canadian Pavilion, Shepherd's Bush.

Dear Sir,—We duly received the sample case of Elberta peaches, and the box with samples of pears.

The peaches arrived in extra good condition compared with others of the same variety that are coming on the market, and we were able to make more money of them than average of what are coming. The fact of this sort being rather uncertain as to condition, depreciates the sale, as so many of them are in rather ripe condition, go rotten very quickly on the salesmen's hands, so that you must not lead your people to expect that they would make this money in quantity. At the same time, we should advise you to draw their attention to the fact that they should not be allowed to get too ripe before sending. All the pears are fairly saleable sorts, but the "Clairgeau" is very treacherous, and if they arrive at all ripe, are worthless. We should, however, suggest that you advise the growers to follow more on the Californian varieties, such as "Doyenne du Comice," "Brown Beurre," "Winter Nelis," and "Glout Morceaux," which are all a better quality than those you send, and being well known here, find a ready sale. As far as the market for peaches is concerned, we are almost clear now, and really good ones in good condition would find a ready sale. The English and French now are practically finished. We shall be pleased to see your Mr. Girardot. The best time for the writer is before one o'clock any day.

Yours faithfully,

(Sgd.) Geo. Monro.

September 18th, 1908.

Messrs. The Canadian Government Exhibition Commission,
Franco-British Exhibition, 1908,
Shepherd's Bush, London W.,
Canadian Pavilion.

GENTLEMEN,—We are in receipt of yours of the 16th inst., and have also received the samples of apples, and have carefully examined them, finding the samples very good of each. The varieties are also good ones for early sale here, and some years they would do exceptionally well. This year, however, there is a very large crop of English, the bulk of which are put on to the market through August and September, so that prices are not up to the average.

The fact that crops of apples here are so uncertain year by year has kept our growers from any proper system of arranging to keep their crops, so that you will see that when the exceptional crop comes, the market is very much flooded as they are taken from the trees.

As a rule, however, these early varieties would pay you to send, and even this year, the color of the "Red Astrachan," "Duchess," and the fact of them both being suitable for dessert apples—would enable us to get better prices than the bulk of the English coming on to the market. We think the best way to pack these two, or similar dessert varieties is in the 40-lb box nett, which is now almost universally used for California, Oregon, and other States for their dessert apples, as well as all coming from the Australian colonies being packed in the same way; and as the earlier varieties are naturally rather softer, it is best to wrap each fruit in paper in the same way that the above are always packed, as it not only protects the fruit, but they color rather more quickly, and generally result in a better clearer color than if packed without wrapping. The "Alexanders" too, would come well in this way unless they were extra large, which often happens with this variety off young vigorous trees; but as they are only used for cooking, the "case" would not be so useful as for the dessert varieties, all our best buyers now being able to buy dessert apples in cases the whole year through, and are more each year in favor of all dessert apples being packed in this way.

One great reason is that so many stores and retail firms can get consumers to take a case where they could not induce them to take a barrel. Another great advantage is that customers can examine the smaller package more easily, and if they are graded into ones and twos for the larger and medium good fruit, keeping all small and bad-shaped fruit out, we should be able to do very well with a regular supply of good dessert apples for our customers all the year round, and are continually getting good grocers on to selling them, who at one time, did not touch fresh fruit at all. We do not sell by auction, so you will realize that if we can keep customers regularly supplied with good dessert fruit in the same size case all the year round, it must be of great advantage to the senders as well as being more easily worked by us as distributors.

Yours faithfully,

(Sgd.) GEO. MUNRO.

Cooking varieties seem to do here in the barrels if well graded.

A letter was also received from Mr. J. A. Alexander, F.R.G.S., who is attached to Kew Gardens, and acted as one of the judges of fruit at the Exhibition.

24 LAWN CRESCENT,
KEW GARDENS, SURREY, 12th Oct., 1908.

Fruit Exhibit in Canadian Court,
Franco-British Exhibition.

In June last I had the honor, with the two leading pomologists in Britain, Messrs. Geo. Bunyard and T. H. Rivers, to adjudicate the fruit in the various courts at the Exhibition. We were most favorably impressed with the quality and high coloring of many of the samples, the apples in particular exhibited at the Canadian Court. Their good keeping qualities were very marked. I have again this week inspected the general fruit exhibit in this Court and find the samples after one year from date of gathering to be in most excellent condition. The peaches and grapes recently received are of fine flavor and compare with equal merit to Australian and Continental fruit grown out of doors.

I see no obstacle in the way of placing the fruit before the British public to find a ready market at a reasonable and remunerative price. Possibly the Commercial Agent of the Dominion (if there is one), might be the best channel to distribute the produce to the retail dealers and customers direct.

(Sgd.) J. A. Alexander,
F.R.G.S., etc., Agri. and Horti. Expert.

From the results of these shipments, there can be no doubt that we can land early apples, pears and peaches on the markets of Great Britain in good condition. If tender fruit is to carry successfully, however, it is necessary that it should be properly handled at this end. I can say this, that in nine cases out of ten when fruit reached its destination in bad condition it was because it had not been delivered to the transportation companies in fit condition to carry safely. This year, with the high temperatures prevailing, it seems strange that more advantage was not taken of the facilities offered in the way of cold storage.

Q.—Should apples be placed in cold storage before they are packed?

A.—It you pack warm apples in barrels and put them in cold storage, it takes a longer time to cool them down than it would if they were in open packages. Cold fruit does not bruise as readily in packing as warm fruit does, and that is also a consideration.

Mr. Peart: The Burlington shippers made shipments in cold storage. We have no cold storage warehouse, but order a refrigerator car a little ahead and cool our fruit in that.

Mr. Ruddick: During a visit to New York State, I was particularly struck with the quantity of apples that were going into cold storage in the various towns along the south Ontario shore. I noticed one point in connection with the business end of the matter that is worthy of consideration. In a good many cases these warehouses operate only during the apple season; they do not attempt any other kind of cold storage business. They expect a season rate for all apples, no matter how long they remain.

Q.—Will a temperature of 40 degrees answer?

A.—That is not low enough for efficient preservation; you should have it as near freezing as possible.

I hope next year, if it is considered desirable, to make some further arrangements for the handling of early fruit. We might arrange for instance to have refrigerator cars start at certain stations and pick up shipments along the route, the same as is done in the case of dairy products.

E. D. Smith: The results of the shipments of which Mr. Ruddick has spoken appear to have been very gratifying so far as the carriage of the fruit on the steamship is concerned. There will be no difficulty in shipping even our peaches if these conditions can be assured. There have been cold storage facilities for years, but they have not been operated in the interest of fruit shippers. This year on account of the Government having secured the chambers, we got the use of them for fruit. I assume they instructed the ship owners as to temperature, and the fruit was carried at that temperature. There is a market in Great Britain for all we can send, but until now, we have not been sure of getting the right temperature crossing the ocean. We tried it year after year, but with such varying results that no one had any confidence. The plan adopted this season should have been undertaken long ago. It has proved that we can ship Bartlett pears over there in proper condition. That is the leading pear to ship. There is also a market for all the Elberta peaches we can grow. I hope the Government will continue this, and place as many cold storage chambers as are necessary at the disposal of

the growers. Cold storage is of no use unless the proper temperature is maintained, and it cannot be if meat and everything else is shipped in the same chamber.

Robert Thompson: As one of those who took part in these shipments, I can voice the feeling of those who joined with me, that unless there is some profit to be made you will not get many men to ship. I think, however, that before these shipments return good figures, it will be necessary to have someone to represent our interests at the other end.

The following resolution was moved by Mr. E. D. Smith, seconded by Mr. R. Thompson, "That it is the desire of this Association that the Department continue to operate cold storage chambers in the manner they did this year, and, if possible, on a larger scale." Carried.

OBSERVATIONS ON FRUIT CONDITIONS BY THE DISTRICT REPRESENTATIVES OF THE DEPARTMENT OF AGRICULTURE.

Essex County.- A. McKenney, Essex.

Although the County of Essex is considered to be one of the greatest fruit counties in the Province, in some respects it is the most backward, particularly in regard to fighting the San Jose scale. That is our most important problem in connection with fruit culture in that section. We have been endeavoring to induce the farmers to take up spraying by holding demonstrations at different points—showing them how to mix lime-sulphur wash and how to apply it. Where these demonstrations have been held, the results have been good. We have also carried on some spraying experiments, with different mixtures, in an orchard of 86 trees, every one heavily encrusted with scale. Before commencing to spray, we took notes of the condition of every tree. We first tried crude oil, then an emulsion of crude oil and Gillett's lye, a second crude oil emulsion, home-made lime and sulphur and the commercial concentrated mixture of lime and sulphur; also the remedies known as V 1 and V 2. After spraying we went over the orchards carefully, taking observations at different times throughout the summer.

We did not expect to get very satisfactory results from crude oil, but it is very cheap there, about a dollar a barrel, and we therefore deemed it wise to experiment with it. It killed the scale, and it also killed three out of four of the trees treated.

In order to lighten the crude oil up a little, we made an emulsion of crude oil and Gillett's lye, and treated four trees. At the end of the season we found the fruit almost entirely clean.

For the other emulsion, we used 12 gallons of crude oil to 40 gallons of water. This killed practicaly all the scale, but the bark of the trees seemed to be slightly injured, and it is a question whether it could be used continuously without affecting the trees.

The results from lime and sulphur were very good indeed. We sprayed four trees, and the fruit showed absolutely no scale spot.

We tested the concentrated lime and sulphur on about 16 trees. We applied it first when the leaves were coming out. There was no serious injury to the foliage, and it killed the greater portion of the scale, and the fruit was clean. This mixture was 1 to 11. The makers recommend a solution of 1 to 50 as a summer spray, but we got no results. With a mixture of 1 to 25 we got results, the majority of the scale being killed.

With the V 1 mixture, which is claimed to kill most of the pests that affect the orchard, we sprayed 25 trees. The results were marked by their absence. The row on one side of these trees was sprayed with lime and sulphur, and on the other with the oil emulsion, and the difference, in favor of the lime and sulphur particularly, was noted by everyone who visited the orchard. We sprayed the V 1 mixture in the proportion of 1 to 100, as called for by the instructions. In two weeks the scale should have been dead, but was as healthy as ever. In everyone of these experiments we left a check tree at the end of the row. We could see absolutely no difference between the trees sprayed with the V 1 solution and the unsprayed tree. We came to the conclusion that the remedy was worthless so far as scale was concerned. It was also claimed that it would kill apple aphis, codling moth and a number of other insects.

Mr. Spark: It was never claimed that it would kill codling moth.

Mr. McKenney: Perhaps not, but it was claimed it would kill aphis. We found a great deal of aphis on these trees, and we sprayed with V 1 and also with V 2. As to V 2, we received a letter from the firm, saying that there was some mistake in the mixture, and that they would send another lot; but we did not have time to apply it.

The results with V 1 were quite conclusive. We were very careful to test it accurately, spraying one side of the tree on one day and the other side when the wind changed, and we put on twice as much as was recommended.

Prince Edward County.—R. M. Winslow, Picton.

The County of Prince Edward has three main sources of revenue, the canning industry, dairying, and orcharding. Very little fruit is canned, and this report will deal altogether with orcharding as an entirely distinct branch of effort.

At the present time, the number of plum trees in the county is small, and the trees are not in good condition, due to hard winters, particularly that of 1903-4, which destroyed a great many fruit trees of all kinds, and also to the Volsa canker and shothole fungus, all combined with a degree of neglect due to a discouraging outlook for the plums as a profitable venture. Pears are in a similar condition, due to the severity of the same winter, canker and blight. Sour cherries are in a very encouraging state; the trees are healthy and bearing well, and the acreage is being extended. As profits have been large of late years, small fruits are grown in the vicinity of Picton and Bloomfield quite extensively, which do well, and the plantations of these are also being extended.

Prince Edward has a climate very much governed by the water of Lake Ontario, the Bay of Quinte, and many small bays and inlets, which give the county, scarcely fifty miles long, over four hundred of shoreline. Spring frosts and fall frosts are very largely governed by this condition, and a long fairly moist season of moderate temperatures is the result. When the water is frozen over, however, the county is like those to the north of it, liable to occasional severe freezes. Such a one ocurred in 1903-4, destroying a great majority of the plum and pear trees, and a large number of apple trees. The blow was so severe that a great many men, before enthusiastic, were discouraged, though many at once set out their new orchard, so that the county has now a very large number of these, practically all apples.

Since that time, the growers have had to contend with many diseases working on trees already weakened. Oyster-shell bark-louse became plentiful and destructive in the next few years, borers were plentiful, fungus diseases got a stronger hold, and since the growers were inclined to place all the blame for the injury done entirely on the hard winter, orchards were allowed to be severely injured by various obscure diseases without any great attempt to locate the cause of the later injury.

In addition to this, a great many of the young trees set out were in a very unhealthy condition. Black heart and blight seem to be the cause of the greatest loss, but buffalo tree hopper, root injury, and the substitution of varieties brought other and serious losses to the planters. So many thousands of dollars have been lost directly and indirectly by the sale of black hearted trees or substituted varieties to the unsuspecting farmer, that his protection from the dishonest or careless nurseryman is a problem of pressing moment in this county. For that reason, we are particularly interested in a law which shall attempt in any degree to eliminate such stock from the trade, or to insure the farmer against loss in this connection.

While the older orchards were gradually dying from winter injury, the spread of insects and diseases went on almost unchecked and unnoticed. Under such circumstances did the black rot canker, or New York apple tree canker come in and secure a strong foothold, with hardly any attempt at identification or control. For this reason, and because of its wider, though less serious, distribution, through Ontario, it seems desirable to report on it at length on this occasion.

The black rot fungus is reported as being prevalent through the greater portion of the Eastern States, from Alabama to the northern boundary, and from New Hampshire west to Illinois and Nebraska. In Ontario it has been reported from so many districts that it may be said to be present in all parts of the Province. It is undoubtedly the worst enemy of the apple in Prince Edward and neighboring centres.

Kinds of Trees Affected.

The fungus affects the leaves of at least the apple, causing the familiar leaf spot, which has erroneously been attributed to Phyllosticta and spray injury. It affects the fruit of apple, pear and quince, causing the well-known black rot. It affects the wood of apple, pear, hawthorn and some forest trees, causing in the trunks of young trees and the limbs of old ones, brown or black sunken areas in the bark, known as cankers. The infection of forest trees does not affect the application of measures for the control of the disease in orchards.

On the foliage of the apple, the disease causes the common leaf spot, usually attributed to the Phyllosticta or the spray injury. The two latter occur on leaves, but this is usually not great, but sometimes it is severe enough to cause defoliation in August or September, especially on young trees, set in old orchards. There, it is, of course, serious, because of the immaturity of the wood, and consequently winter killing.

On the Fruit. The black rot of the fruit has been known for some twenty years. It is not usually serious in the orchards, though it may cause a loss of several per cent. of fruit still on the trees. It is a common rot of fallen fruit and stored fruit. Infection seems to be possible only after mechanical rupture of the skin of the fruit. The distinguishing features of this rot are: It is firm and not much sunken, if any; it turns

from brown to black, and black pustules about one-hundredth of an inch in diameter appear in large numbers in October and November. The fruit dries up and mummies, usually falling to the ground.

On the Tree. The cankers on the trunk of a young tree appear as a slightly sunken area of brownish bark. This dead area enlarges often in well marked concentric rings. The growth is usually fairly rapid, and the canker may extend clear around the trunk and up into the branches. Black pustules develop in late summer and fall; these are similar in nature and function to those on the fruit. They are not found on young cankers before late summer, and on cankers over two years old they have usually disappeared.

In the fall, the dead bark in the canker becomes roughened and cracked by dying out, and the growth of sapkophytic fungi usually turns it black. On old trees cankers occur on limbs of from one to several inches in diameter. They grow more slowly, more irregularly, and are less easily recognized than cankers on young trees. Owing to the congestion of sap and consequent deposition of wood, these cankers are often swollen to a size greater than the natural diameter of the limb.

The canker is the serious feature of this disease. The rot does little damage, and the leaf spot is of little consequence, but the cankers are causing really great loss to apple orchards in this section.

Life History of the Fungus.

This is not yet thoroughly known. We know, however, that the canker of fungus is perennial as mycelium in the cankers, and reproduces itself from leaf, fruit, and canker, by means of spores found in the pustules. These spores are shed in the spring, and are carried by rain or wind where under suitable condition of moisture and warmth they penetrate the plant, forming the disease again. It is known that the spores on the cankers may form leaf spot and that spores from rotten apples form cankers. There seems no doubt that the disease is transmissible from any one form to another.

Control of Disease.

1. Cut out and burn dying branches or dead and dying trees. Destroy apples affected with rot, by feeding to hogs or removing and burying at once. The practice of leaving dead branches or trees in place, or leaving them in brush piles in the orchard is dangerous, and should not be followed. The use of cankered limbs as props for the trees is of course a direct aid to the infection of healthy wood.

2. Where infection is not too severe and trees can be saved profitably by this means, it will pay to cut out, disinfect, and paint over the cankers. In cutting out it is necessary to remove all the diseased tissue, and disinfection should proceed at once. Use corrosive sublimate tablets, dissolved in one pint of water, kept in a glass or wooden vessel and put on with a brush. This is a very strong poison. For paint, a heavy bodied paint that is waterproof and germ proof for several years is wanted. White lead and raw oil make a very good one. Cutting out of cankers will pay where there are only a few on an old tree. It will also pay where a canker is located on the trunk of a young tree. It is a good economy to spend a few cents to preserve the life of a tree in which several dollars have been invested.

3. On old trees badly affected, the practice of re-heading must be followed. Save the suckers, and as they become able to take the sap remove the diseased branches. This is best spread over two or three years, and is

easily practised on Spy, Snow, Russet, etc. On trees that sucker less easily, it may be necessary to insert scions of the same or another variety. In this work, limbs up to six inches in diameter have been found to graft successfully.

4. Since the greater part of the cankers on young trees is following sunscald, it will certainly pay to protect from sun-scald where that is prevalent. Building paper, wrapped tightly around the trunk is a protection against mice as well as sunscald. It is applied in the fall and removed in late spring. Protection of the trunk is generally necessary only on those from two inches in diameter up to the time when enough rough bark forms to render paper unnecessary.

5. It has been constantly observed that trees in good vigorous condition suffered less from canker than others. It is true in general that good health is the best preventive of disease, and this is quite true of apple cankers. Generally speaking, sod is a detriment to the best success of an orchard, and wherever it is present, should be broken up, the soil cultivated in the spring and cover crops ploughed down. Barnyard manure, wood ashes, or commercial fertilizers will give not only profitable returns for the application, but as a preventive of canker as well. Pruning and spraying will also be advisable.

Spraying to prevent scab and other fungus diseases, when carefully and persistently followed up, has resulted in a comparative freedom from canker. It is probable, therefore, that spraying for canker three times with Bordeaux mixture, first before the buds open, next after the blossoms fall, and third, ten days after the second will result in efficient control of canker. It may be advisable to substitute lime sulphur, either home boiled or commercial for the first Bordeaux spraying, especially where leaf blister mite, or oyster-shell bark-louse is present.

The black rot fungus, which is widespread over the United States and Ontario, is especially prevalent in Prince Edward and neighboring counties. It causes leaf spot, black rot of the fruit, and canker on the limbs and trunks of apple trees. The canker does a great deal of injury to both young and old orchards.

Control of this will be secured by the following methods:—

1. Cleaning up and burning as much of the dead and dying wood as possible and destruction of rotted apples.

2. Where cankers occur on the trunks of young trees and are not too large to be so treated, cutting out, disinfecting and painting the affected area.

3. On trees whose limbs are so badly affected as to render cleaning out the cankers impossible, cutting back the limbs below the cankers and forming a new head in one, two or three years by using the suckers or inserting scions of the same or other varieties.

4. Prevention of sunscald and other injuries to the bark of trunks and limbs.

5. Increased vigor and healthfulness of orchards, by cultivation, manuring, clover crops ploughed down, pruning and spraying.

6. Spraying to prevent infection, using Bordeaux mixture or lime-sulphur before the buds open, Bordeaux mixture after the blossoms fall, and a third spray with the same ten days later.

GEORGIAN BAY DISTRICT.—R. E. MORTIMER, COLLINGWOOD.

If one were to depend upon the statistics that may be at hand regarding the acreage of orchards in the Georgian Bay district, together with what information he may have obtained in reference to the establishment of storage plants, canning factores, evaporators, apple-butter factories and cider mills, he might conclude that this section was one of the distinguished fruit districts of the province; and rightly so, if he does not entertain a misconception regarding the conditions that prevail there at the present time.

It is true that there are numerous orchards varying in extent from one to forty acres; it is true that an enormous storage and forwarding plant has its existence under the title of "The Georgian Bay Fruit Growers, Limited," with branches at Thornbury and Meaford; it is true that the Collingwood Packing Company have begun the fruit canning business, and it is also true that cider mills and apple-butter factories are almost as common as post offices; yet I claim that if one, knowing of these establishments, based his opinion thereon, that everything was lovely regarding fruit growing in this district, he would be not right. He would have no idea of the feeling, or fruit-growing spirit among the growers, which I am sorry to find is not what it might be, and is not what it should be for the proper development of the industry. Just whether the growers there ever did have the real zeal of a fruitman, may be difficult to say; but it is quite evident that they have allowed their interest to "flag." Of course, there has been some reason for this, which if we could remedy now we might soon again be classed with the best fruit districts of Ontario.

Just a few words now in reference to what might have been effective in producing this great indifference apparent among the majority of the fruit-growers: No doubt, just as in other districts, there are men who have been buying apples as a private business. Their methods were to buy by the barrel, by the tree or by the orchard; but in every case the object was to get the goods at the very lowest price possible. We believe, further, that more or less scheming was done between or among the buyers, because orchards were "parcelled"—that is, one buyer would come for this man's apples, the the other would take that man's, without any competition whatever, and the grower got only one bid; he had no option. Some buyers were even clever enough to get around in August, before the fruit was grown, and when there was not any appearances of a good crop, and buy the orchard. It was a comparatively easy thing to do at that time, when farmers' bank accounts were slimmest, and a great number of sales were then made, most of which, in the end, were to the disadvantage of the grower. Other little things, too, which we need not refer to here, have done a part to render fruit-growing less interesting as well as less profitable. Can you blame the growers much then, in ceasing to work to the interests of men, selfish indeed, who cared not a whit whether the producer found the industry profitable or not, so long as they themselves did, and who would not do the smallest act to further fruit-growing, to the growers' interests?

Then you may ask a man why he does not spray his orchard, why he has not pruned it; why does he leave it in sod; why not cultivate, spray and prune according to the advice given by expert growers, and he will tell you "I haven't time," or "It doesn't pay me," either of which seems absurd, in view of the remarkably good results being obtained from good treatment of orchards elsewhere; but still each is a truism. No man has time for anything that is not profitable; and I really believe that the fruit markets might be controlled by monoplies to such an extent, that any time a man would

spend in sharpening his pruning saw would be utterly lost. Remember, I do not go so far as to say that such has been the case in our district; but there has been something that has discouraged the growers, and I think it is the treatment measured out by the buyers and packers. What we want, then, and what we must have to revive fruit-growing and to conduct it as it should be conducted, is some concern to handle the products, and deal honestly and fairly with the growers; and, I believe we have such in the co-operative organization, "The Georgian Bay Fruit Growers, Limited." But it is not my object to discuss the same here; the President, Mr. John Mitchell, is with us, and I hope that he will be given an opportunity to speak in reference to the work of the association, of which he is justly proud. I have not the slightest doubt but that with honest treatment from the men who put our fruit on the market, every grower will go back into the work with a new heart. We might be able to do something in the meantime to hasten the day when orchards are no longer ill-treated, the day when those unsprayed, unpruned, and uncultivated acres are not seen. I had an idea that it would be possible to give a few orchards in each locality proper treatment by a man appointed to the district, and by that as an object lesson, show the growers what really is to be gained both in quality and quantity, by pruning, spraying and cultivating. In talking to Mr. Mitchell, to whom I have already referred, the other day, I learned an idea from him which should be good, indeed, in inducing the growers to take off their coats again. It is truly a bright idea, well worthy of the consideration of the Ontario Fruit Growers' Association so well as the Provincial Government, and I should like to see it adopted, and I take the liberty to say that Mr. Mitchell will present it when asked to do so.

Then, while fruit-growing is not where it should be in a naturally favored section such as the Georgian Bay District is, I am confident that with the adoption of these ideas, and the extension of the co-operative organization, "The Georgian Bay Fruit Growers', Limited," to which I have already referred—to other localities of the district other than its present locations at Thornbury and Meaford, there will be a great revival in fruit-growing, and one day the Georgian Bay District, will not merely be classed with the best fruit sections of the Province, but will be conceded, universally, to be the premier.

Mr. A. McNeill, Fruit Division, Ottawa: Nine-tenths of the difficulties complained of would disappear if the suggestions contained in the foregoing address for co-operation were put into effect. Farmers have the remedy in their own hands. It would be better not to wait for the Georgian Bay Fruit Growers' Association, or any other large concern, but for farmers to unite, half a dozen in a place, and form these unions over the county. This would be better than for one large concern to control the whole situation.

Ontario County.—J. H. Hare, Whitby.

To prove that Ontario county is a great apple producing district—that is the southern end of it—I have only to instance the numerous prizes Ontario county growers have obtained at the Fruit Show here. Unfortunately all the fruit growers in the county are not up to the standard of these men, although we have some of the best growers in the Province in the vicinity of Oshawa and Whitby. I believe it to be one of the best apple growing districts in the Province. In Oshawa we have a co-operative association that is doing splendid work, and the influence of the association is very evident in the vicinity.

Being paid for their fruit according to quality, the growers realize the importance of a first-class output, and are paying more attention to spraying and proper methods of orchard management. Twenty-five per cent. of the growers in the vicinity of Oshawa are spraying, but speaking generally, over the whole county, I should say that not more than ten per cent. are doing so. Those who spray in the Oshawa district are satisfied apparently with results, because they continue to spray year after year.

This year there was very little codling moth. The county has an advantage in this respect on account of the altitude, or for some such reason. We have a comparatively new pest, however, in the blister leaf mite. In some of the orchards, trees have been killed by fleshy fungus. This sometimes occurs where trees have been badly pruned, showing the necessity for treating the wounds.

The oyster-shell bark-louse is the worst pest we have. Some growers near Oshawa, however, have successfully destroyed this pest, and this will serve as an object lesson. There is a good deal of canker, especially in the younger trees. It is not as bad as in Prince Edward county, but it is doing a good deal of harm. On account of the difficulty in eradicating it, I believe it is the greatest problem we have to face. The farmers generally regard it as winter-killing.

Of the younger orchards, I should say 50 per cent. are fairly healthy, and that the other 50 per cent. are more or less attacked by oyster-shell and sunscald, generally followed by canker.

PACKING AND PACKAGES—MARKETING OUR APPLES.

By Elmer Lick, Oshawa.

The problem of packing apples depends very largely on the quality of the fruit we have to work with. If we have fine, well-grown, well-colored fruit, free from insect and fungous blemishes, we have a comparatively easy task. If, on the other hand we have, as we did a year ago, green, immature, or frozen specimens, then the task is a most difficult one.

Good packing depends very largely, first on the skill, and second on the character, of the men doing the work. With skilful men who are honest, it is a comparatively easy matter to get apples packed as they should be.

Apples are packed in all manners and styles,—some of them not the wisest—and in all conditions. I do not wish to criticise the average dealer's gang, but I will say that I dread to see a man who has worked during the fall with the average apple gang come into our packing house. We took on a couple of such men a short time ago, and they admitted before they had been there very long that the methods they had followed were very careless. They had been packing for the Manitoba trade. The apple should be treated like an egg, and any treatment that would be likely to break an egg, we should be very cautious about giving to our apples. Another element that enters into the situation is the picking of the fruit. In our association we do not do much packing in the orchard, unless it is too far distant from the fruit house. Often the men who pick their own fruit are very careless in handling it, and bruise it so that we have to throw out one-third of it on that account. More careful handling and picking are very necessary, and after it is picked the fruit should be drawn to the station in spring wagons, one of the things that dealers are very neglectful of.

But after all, the most important thing is the reliability of the men doing the work. You have pretty nearly to get men whom you can trust implicitly. I do not know how it is in other sections, but there are lots of young men in our section who will not go with the average apple gang because of the bad character of the men who compose them. In many sections growers will not board the men or keep them over night.

It is also very desirable that the grower should take a personal interest in his fruit, and that his interest should keep up until the fruit is ready to be put upon the market. That is what we are striving to arouse in the members of our association, as in my opinion success or failure depends largely on this factor. No matter by what method or combination of methods apples are to be handled in the future, success must always depend on the personal interest taken by the grower in his fruit until it is marketed. The methods of dealers in the past have not helped much to that end. We had a man in our Association last year who brought 126 barrels of apples to our house—mostly Ben Davis. He received less than $26 for them; there were scarcely any No. 1's. This year he took thorough care of his orchard, spraying once with arsenate of lead, and there was scarcely a wormy apple in the whole crop. This man's apples gained first in the barrel and first on the pyramid at this show. This man has a brother, also a member of our association. Out of a crop of 300 to 350 barrels he brought in only 60 or 70 barrels, leaving the rest on his trees because of the codling worm. We are trying to bring these men to realize that they must produce better fruit.

As to packing: It would not be difficult to prove that you can pack more apples and pack them better with less skilled labor, with fewer men to superintend, by packing in the fruit house rather than the orchard, and be surer of your pack. I am not prepared to say that you can pack any cheaper. I am inclined to think that the cost is about the same, perhaps in some cases a little less in the orchard.

We like a face of evenly sized apples. In filling, the barrel should rest on an even surface, and be rocked or jarred as each basket of apples is put in. Many packers simply give one jar. After the barrel is full, we have been in the habit of double tailing, but I believe the best way to finish is by simply racking down after the barrel is full. The difficulty with double tailing is that an apple will sometimes get directly above the one beneath, leading to injury.

We brand our barrels before they are filled, which saves the necessity of marking with a pencil. With regard to the barrel: We like a good barrel. We like five nails in the liner, two of which should come through and be clinched, as an indication that the others have been properly driven home. We ought to have a better barrel than we have been getting. I prefer a basswood head, for the reason that when the apples are pressed with the circular head block, we can get spring in the centre with the basswood head, and we consider that this, together with the natural resistance of the apples, is likely to carry the package tight to the market without nearly as much pressure as we formerly gave our fruit. It is difficult to get basswood heads, most of the heads supplied being of hardwood.

We have been using boxes for the last two years. These we wire around the centre to prevent splitting. I understand that the Tasmania boxes are all wired in this way.

Mr. TWEDDLE: There was a great deal of damage to apples this season on account of hot weather at the time of packing. My practice has been to bore one inch holes in the staves at the bilge of the barrels. I have shipped apples to Germany in hot weather in that way, and they carried in splendid

shape, although some were delayed in New York for two weeks, and I thought would be spoiled. Last year a buyer from Manchester was here and bought a shipment of my apples. When he saw us boring the holes, he requested that it should not be done. However, he afterwards reported that the barrels that were bored came through in perfect condition, while the other fruit had commenced to scald.

PACKING AND PACKAGES—TENDER FRUITS.

H. L. Roberts, Grimsby.

The package question for fruits might truly, I think, be called the hardy perennial of fruit growers' meetings. I am glad it is, because I think this shows that growers realize that it is one of the most vital questions of the whole industry. The success or failure of any business depends on the shape in which its product reaches the consumer, and to no industry does that apply with such force as to those which are concerned with the food of our fellow men, and in fruit we have the most perishable food used by human beings.

Please note in this connection that I say the shape in which the article *reaches the consumer*. Unfortunately, too many fruit growers think that their part has ended when they hand over their fruit to the transportation company in fine shape, nicely packed in a package which, if they have given the subject any consideration, they know is quite unfit to stand the handling it will receive.

Before going into the question of the package I will say all I have to say—which is not much—on the packing. This should be considered under two heads, firstly, as it affects the fruit industry generally, *i.e.*, other growers, and secondly, as it affects the individual owning the fruit. As to affecting the fruit industry generally, the following three points must be enforced: First, that the fruit must be properly matured; second, evenly graded; third, that the face is a proper sample of the contents. No man, however, good a grower, can grow all number one fruit, a varying proportion must be of lower grade. If, however, his grading is even, and his facing a true sample, his poor fruit will damage himself more than other growers, although, of course, all poor fruit helps to destroy the price of good. A certain amount of cheap fruit is wanted by the market, and if we could only reduce the proportion of it to the right place, we would do away with the damage it now does the good fruit.

I think the dealer is largely to blame in this matter, as he sets the price, and does not discriminate enough between good and poor fruit. Whatever the grade may be, it must, in justice to the trade generally, be even and up to the sample shown on top. It must also be properly matured. Inspectors to enforce these three points are a crying necessity. That they should be enforced rigidly I think no one will deny, because a man who does not carry them out is simply trying to dishonestly make a profit at the expense of his honest neighbor. Of course, the proper method for dishonesty is for the person who is swindled to take proceedings against the swindler. Unfortunately in the fruit industry, this is almost impossible in most cases, as the fruit has to move so quickly, through so many hands before the fraud is discovered that tracing it back from the consumer is generally a practical impossibility.

The means the consumer therefore takes to protect himself is simply to give a price which he thinks would be right for the package if it were not up to its face value. The dishonest packer therefore gets full value, while the honest one loses. It therefore behooves the honest grower to see that the dishonest man is detected. There are two means of accomplishing this—one is to enable the tracing to be done by forcing every packer to stamp his name and address on his basket. The other is to have inspectors at the points of shipment.

The stamping method is, of course, the cheaper, but would probably be objected to by the dealers. If they have objections to that method, then I think it is up to them to stand the larger part of the expense of inspectors. Those qualities of pack affecting the individual packer *only* are neatness and attractiveness. These can safely be left to the individual himself, as failure to comply with them will bring its own reward, but will do no one but himself harm.

Regarding the package, I would say at once, that I do not condem the present six and eleven quart baskets as regards size. This subject was well discussed and gone into at many largely attended meetings of fruit growers and although a compromise can be made which has to take into consideration the demands of the grower, consumer, and express company all in one package. It is a compromise in another respect as between strength and cost, and unfortunately these two last are generally contradictory. To my mind the present baskets are far too expensive and not expensive enough. Far too expensive when carrying low grade of cheap fruit and not strong enough (more strength means more expense) for the best grades of fruit.

Where is the sense in selling grapes at 10 cents per basket, as many growers have had to do this season, when the package costs you 3.8 cents, leaving you 6.2 cents for the grapes. Are these correct proportions between cost of packages and value of contents? I think not.

Again take the Keiffer pears at 15 cents per basket, of which the basket costs you 4½ cents, leaving 10½ cents for the pears. That is not quite so bad, but is it right? On the otherhand, take No. 1 peaches, at 60 cents per basket, and look at the awful state they too often reach the consumer's hands in, compared to the state in which they left the grower. I think there would have been far more than 10 cents added to the price of the peaches if there had been 5 cents added to the strength of the package.

It is very easy to show the faults in anything as it exists, but very difficult to propose a really satisfactory remedy. I will not, therefore, discuss the faults of the present package any further, but will endeavor to explain my ideas as to how a satisfactory package may be got.

Now, let us consider what are the conditions that an ideal package would have to fulfil? First, it should suit the sort of fruit it is to carry; second, it should suit the consumer; third, the value of it should correspond with the value of the fruit in it. This last is a matter of extreme importance, but it is really the limit to which we may go in reaching a satisfactory answer to the three first conditions, and as this last varies with the value of the fruit, a satisfactory solution is by no means easy.

Now, we are going to limit the expense we are willing to go to in getting a satisfactory package for high grade fruit to the low limit that the price of low grade stuff will warrant. I think we should not. The majority of lower grade fruit is not wasted in small packages, because it is nearly all used for preserving, and I do not think the average householder only preserves eleven

quarts of anything, generally it is at least twenty-two quarts, and oftener more than that. Now, for this grade of fruit a light package such as the present is good enough, but too expensive.

Therefore, I would say the simplest solution to this part of the question is increase the size so that the cost of package may be less in proportion to the value of the contents. By adopting this method we give ourselves the chance to adopt a satisfactory package, meeting all other conditions for good grade fruit, the cost of it remaining about the same as present package.

In this improved package we have to meet the following conditions: To suit the sort of fruit, *i.e.*, both variety and grade, it should be of a great variety of sizes. To suit the handling, two conditions are necessary; first, uniformity of size, so that they will stack well and securely, and second, strength. To suit the consumer a great variety of size would be best. Here we have two conditions which are absolutely contradictory. For the grower and consumer, a great variety of sizes, for the transportation company, uniformity of size. The only solution is various sized packages fitting into a uniform crate for transportation. I have found from experience that the package meeting with the least damage in transportation is the 24 quart berry crate. It has one of the tenderest fruits to carry, yet it does it well, not because the express companies show any special consideration, but because from its size and weight and strength they are unable to do it so much damage.

I would therefore adopt a size and weight as near this as possible for our crate. I would make the height and length of all crates the same to facilitate stacking. I would vary the width a little if necessary to allow of all sorts and sizes of light baskets inside (these smaller packages to be made oblong or square, according to how they fitted, but in the style of the berry quart). The varying depth of inner package required could be got by varying the number of layers in the crate. The small packages, could, of course, be made very cheaply and might be of any size. I would suggest 8 and 4 quarts, with, of course, the quart retained as at present for berries. These crates could, if thought advisable, be made collapsable so that they might be returned empty. They could then be made much stronger.

There is another thing essential—these crates must have a handle on top as the present berry crate has. If they had not they would be treated as I have seen the Georgia peach crate treated in transit—that is, rolled over and over. The only way to get fruit transported properly is to make the package so that the transportation companies' employees cannot damage it unless they go about it wilfully.

I am quite aware that the first example I gave on price of packages as compared to contents (that is the grapes) is only met satisfactorily if the crate be made collapsable. The grapes are the worst problem of all. They are very low in price, therefore requiring a cheap package and very easily damaged; therefore the difficulty cannot be met as in other cheap fruits—by increasing the size of the packages. The returnable crate seems to be the only solution of the difficulty. Now, as to the adoption of the returnable crate. There are, of course, difficulties in making any change of package. Who are likely to be the kickers? and why? *The grower* will be satisfied because it will give him a cheaper package in the end. Of course, he will have to provide about half—or rather more—of the total number of crates he will require in the season, and will have to have them all stamped with his name and address. *The transportation companies* will like the crate owing to the time it will save in handling, compared to the present method. Their objection will be the returning empty. Why should they object? In Eng-

land, all fruit packages are returnable empty free of charge, and I think most European countries are the same. The express companies would be saved enough time in the handling to more than recompense them for the returning of the folded crates.

The dealer, of course, would not object, but the difficulty would be to get him to return the crates. If, however, it was made to his pecuniary advantage to do so—as for instance by offering half the value of the crate for its return, I think that the difficulty would be met, and the grower still be well ahead of the game. As to the cost of these crates I can give no figures on collapsable ones. If the crates were not collapsable, I suppose they would cost about the same as the present berry crates, or not a great deal more.

In the case of the baskets for the inside, we can judge of the cost from the value of the quart basket for the Georgia crate, which was sold this season in Grimbsy for one cent. I offer these suggestions for consideration, feeling that between the downward trend in the value of fruit, and the steady increase from year to year in the cost of packages, we are rapidly reaching a position of absurdity which must be tackled soon. The increase in the cost of baskets has been steady and gives every sign of continuing so.

THE MARKETING OF ONTARIO FRUIT.

By F. G. H. Pattison, Grimsby.

The subject assigned to me of "Markets," or, the distribution of the fruit crop, is one of the most important in the fruit growing industry. For the entire science of fruit growing can be briefly expressed in two words, "production" and "distribution;" and the time and labor expended in producing a good article of fruit is wasted if we do not adopt a systematic and proper system of distributing it. Let us now, accordingly, consider what would be an ideal system of distribution and then examine our present systems and see how far they come up to, or fall short of it; and let me here preface that I am going to discuss mainly the distribution of our basket fruits throughout the Dominion of Canada. An ideal system, I take it, is one which enables the fruit growers to deliver to the consumers in every practicable place throughout the territory mentioned, an even supply of good honestly packed fruit during the season at a reasonable price, whilst at the same time securing a fair profit for themselves and for all who handle the fruit on the way. Taking this definition as a text I purpose preaching on it a sermon as brief as my natural disposition will permit of. I am also going to avail myself of the usual privilege accorded to reverend word-mongers, of dwelling elaborately on some points and comparatively lightly upon others. You will notice that this ideal system comtemplates the handling of good fruit. Are the large majority of our growers producing good fruit? The answer is, no. A considerable number are, a considerable number are not doing so as yet. Next, the fruit must be honestly packed. A system of distribution which does not insist upon this is certainly not an ideal one. Is by far the larger proportion of fruit shipped from the fruit district honestly packed? I wish that I could say "yes" to that question, but, George-Washington-like, I cannot. In spite of all that has been spoken and written upon the subject, a large amount of dishonestly packed fruit, nay, even unwholesome fruit, is continually being unloaded on the public.

Travel through the great fruit belt between Toronto and the Niagara River in the fruit season, and look at the fruit hanging upon the trees and vines, and you would imagine that but little poor fruit ever came upon the market. Travel through the towns outside of the fruit belt, and behold the fruit exposed for sale, and you would wonder if any good fruit was grown here.

The fruit growers are a noble body of men, but, as our friend, J. H. Hale, of Georgia and Massachusetts fame, would say, "They need watching," and there is a simple method of watching them which can be easily applied without much expense. That is the appointment of three or four travelling inspectors, to act during the fruit season between Toronto and the Niagara River, and inspect the fruit at the point of shipment, endowed with authority from the government to stop the shipment of fruit either dishonestly packed or unfit for consumption, publish the names of the offenders, and have such penalties inflicted on them as may be thought advisable. Three to four competent men could easily cover that territory, and would only be needed for four months in the year. A salary of from $100 to $150 per month would be ample to secure such men. The public would be protected and honest fruit growers encouraged at a cost of at most $2,400 a year—a small sum to secure such great results. It is a matter greatly to be deplored that the Fruit Marks Act, which has greatly improved the export apple trade, has been allowed to remain almost a dead letter as far as the home fruit basket trade is concerned.

The following are the chief methods of distribution at present available to growers: 1, open markets in or adjacent to the fruit belt; 2, the commission system; 3, the order system; 4, the co-operative system; 5, canning and wine factories. No. 1 will not need much discussion and is confined chiefly to Niagara Falls, St. Catharines, Hamilton and, partially, Toronto, Of these, Hamilton is by far the most valuable open market to the fruit grower, and a very large amount of fruit is disposed of in this way there, buyers coming from other places in great numbers. There is a fruit inspector on this market who looks after the fruit packages fairly well and consequently restrains certain propensities of the fruit growers already referred to. No. 2, the commission system demands more attention. In the early day of fruit growing in the Niagara district the bulk of all the fruit shipped was dumped into the hands of commission men in Toronto and Montreal to be distributed by them as they saw fit, they keeping as much of the proceeds as they choose, and remitting the balance to the growers. These conditions produced a heavy crop of commission men in the cities referred to, some of whom sprang up like mushrooms in the night, stayed in business for a little while, obtaining high prices for fruit consigned them, then, suddenly vanished, taking with them much of the growers' hard-earned money. Under this system, too, the market was very uncertain, high prices ruling one week and slaughter prices the next; and even the better class of commission houses seemed utterly unable to prevent these "slumps." To counteract such abuses, in August of 1889, a number of prominent growers in the Niagara District formed the Niagara District Fruit Growers Stock Co., which established agents for whom the company was financially responsible, not only in Toronto and Montreal, but in many cities and towns all over Ontario and Quebec and later in the Northwest. This was a great improvement, as by this means the fruit was better distributed, new markets being continually opened up by the company; and the growers were, to a great extent, protected against financial loss. This company certainly did a lot of good, and indeed at certain times was the salvation of

the fruit industry. It also bought baskets at wholesale rates, thus effecting a considerable saving for its patrons. All its sales, however, were made upon a commission basis. In the meantime, in 1879, Mr. E. D. Smith, of Winona, inaugurated a much better plan of selling, viz: The order and quotation system, No. 3, upon our list, by which fruit is sold on order directly to the retailers throughout the country at a fixed price f.o.b. at the point of shipment, price quotations being sent out in advance to the customers at frequent intervals. By this method for the first time in the history of our fruit trade, the growers had some say in fixing the price of their fruit. Mr. Smith was followed by others of the large growers and there soon sprang into existence a number of local buyers, men who purchased fruit from their neighbors for cash and shipped it on quotation to customers all over the country. The number of these buyers rapidly increased till they covered practically the whole of the fruit district and handled a very large percentage of the fruit grown.

For a good many years this system was a great assistance in improving the quality of the fruit produced, as the buyers examined the fruit and refused to pay good prices for poor stuff; but as their business grew to very large proportions and competition increased amongst them for the fruit, the examination came to be of a very superficial character, and now a great deal of very poor fruit is got off by the growers on the dealers at the price of good fruit, and this, when shipped, does not give satisfaction either to the retailers or to the consuming public. Hence the urgent need of travelling inspectors as already outlined by me, to protect the public. Sometimes, moreover the buyers in their eagerness to secure customers, offered fruit to dealers at outside points, at prices lower that it was worth, the result being that the market was lowered to such an extent that growers actually were selling their fruit to the buyers at less than the cost of production.

To remedy this the plan of uniform quotations was established, by which similar prices were granted to retailers by buyers from all the different shipping points, and this has worked fairly well for the last two or three years. The adoption of this order system has had the effect of reducing considerably the number of commission men in the cities and larger towns, leaving only the more reputable houses in the trade, and has done away with them altogether in some of the smaller places.

No. 4. The co-operative system now demands attention. About the year 1883, some of the leading growers around Burlington formed a co-operative association called "The Burlington Shippers Co." for the purpose of shipping their apples and pears to the Old Country. This company has been in existence ever since and has shipped more or less fruit every year, and the results in the main have been satisfactory to its members, of whom there are now about fifteen.

In the year 1898, the fruit growers in the neighborhood of St. Catharines formed a co-operative company termed the St. Catharines Cold Storage Company. Beginning in a small way, the company has been very successful as a purchasing and distributing company, storing, packing and distributing fruit for its members and selling it both by order and by commission, also purchasing supplies of all kinds in wholesale quantities at a great reduction in price. In the year 1907, they shipped out 210 cars of fruit, netting about $100,000 and saving their members $21,000 in express charges alone, and also purchased $25,000 worth of supplies at a large saving to their patrons. This company has raised the standard of fruit produced in its neighborhood, and has enabled the growers to realize better prices for their fruit, whilst at the same time giving the consumers a better article.

In 1905, the Grimbsy Co-operative Company was formed, a purely distributive company confined to a few growers. This company has proved fairly successful, has turned out a good quality of fruit, and has given good returns to its members.

Quite a number of co-operative societies have come into being throughout Ontario, for the purpose of handling apples during the last four or five years at Simcoe, Walkerton, Oshawa, Oakville and a number of other places, and have met with a fair measure of success.

No. 5. The last method on our list, is by means of canning and wine factories. These two, especially the canning factories, have been very valuable aids to the fruit growers. By buying large quantities of fruit at profitable prices to the growers they have at many times kept the market in a healthy condition and prevented a glut and the consequent drop in prices. They have also opened up new markets in Europe, South Africa and other places. In the past, it is true there has at times been some friction between the growers and the factories. On the one hand, the factories have tried to make the price too low and have not always strictly carried out their contracts, and on the other hand, the growers have tried to unload inferior produce in the factories, but the fact is that the factories and the growers are mutually dependent on one another. On the one hand the factories cannot exist without the growers, on the other many parts of the country largely depend on the factories for a market. Undoubtedly it is to the best interests of the canning factories, to pay as large a price to the growers as they can, consistently with making a fair profit on their finished product. At the same time, the growers ought to take a pride in supplying the factories with produce of good quality, for the factories need a high class of goods produced in order to enable them to successfully compete with other countries in the world's markets. All these systems exist to-day and all are needed, one system frequently acting as a check upon another. In the larger cities, the better class of commission houses are quite necessary to the distribution of the fruit there, and local buyers, purchasing for cash and selling on order at uniform quotations, supplemented by local inspectors at the points of shipment, make an excellent means of distributing the crop.

To me, the co-operative system seems to afford the best outlook in the future for the ordinary grower, who undoubtedly is not fitted to both produce a good article of fruit and to distribute the same so as to bring him the best returns. A co-operative society certainly demands a good capable man for manager and one who can gain the confidence of the growers. Under such, I think that system approaches nearer to the ideal than any other. By purchasing supplies in wholesale quantities and shipping in carload lots, a great saving is effected, and more can be accomplished with the carrying companies by an organization of this kind, than by individuals. By this means the packing can be carefully attended to, and an article of uniform excellence turned out, which will give satisfaction to the consumer. Sales can be made on order for nearly all the better grades, and arrangements can be made with the canning and wine factories to considerable advantage. This system encourages the grower to produce a good article of fruit, as he knows he will get good value for it. As co-operative societies increase and further develop, the supply of fruit can be largely controlled and thus in a measure, the price. The next few years will probably see considerable development along this line and the day may come when all the growers in our fruit belt between Toronto and the Niagara River will be united in one central organization, controlling the output and operating through smaller societies at each shipping point.

PROPOSED LEGISLATION.

President PEART: It has been suggested that some legislation should be asked for in regard to the codling moth and little peach. I would suggest that a resolution be passed empowering the executive to deal with the matter.

Mr. TWEDDLE: A law to be effective should empower the municipality to pass a by-law making it compulsory to spray for codling moth, and in the event of an owner failing to do so the municipality should do the work and charge it against him, the same as in the weed by-law. A petition by fifteen ratepayers should compel action on the part of the municipality.

R. THOMPSON: A clause might be added to the Act respecting Black Knot and Yellows.

A. E. SHERRINGTON: There are some growers who control codling moth by other means than by spraying, and it would not be fair to compel spraying in such cases.

The PRESIDENT: Empower the executive to prepare legislation along lines similar to the present Yellows and Black Knot Act so as to make it applicable to these present troubles.

REPORT OF THE COMMITTEE ON RESOLUTIONS.

IN MEMORIAM—THE LATE DR. JAMES FLETCHER.

Moved by Mr. HAROLD JONES, seconded by E. D. SMITH, "Whereas the announcement of the untimely death of Dr. James Fletcher, Entomologist and Botanist of the Central Experimental Farm, has come as a grievous shock to his many friends; that the Fruit Growers' Association of Ontario at this time assembled in Annual Convention at Toronto do convey to his sorrowing family, and to Dr. Saunders and the staff of the Experimental Farm, this expression of our own deep regret and of sympathy with them in the loss they have sustained, a loss which is indeed common to the whole Dominion, over which the deceased gentleman was well known and highly esteemed."—Carried.

Mr. HAROLD JONES, Maitland: Dr. Fletcher was a very dear friend of mine, and, I am sure, of a great many here. He built up a record for himself in this country in connection with his work. For some years past he was recognized in the whole of America as our leading entomologist and botanist. I do not think there is his peer in America to-day. He had the faculty of making himself understood by children as well as by adults. He took a deep interest in everybody he met, and remembered faces and people. I feel that it is our duty and privilege to mark our appreciation of his work and character by passing a resolution of sympathy and forwarding it to his family and fellow workers of the Central Experimental Farm. I feel that we ought to show our appreciation of the work he has done for us, and for this country as a whole.

Mr. STEVENS: Dr. Fletcher was well known and well liked by all who knew him. It is a great many years ago since he first came to the Central Experimental Farm and assisted Dr. Saunders to organize it, and afterwards to bring it to its present high state of efficiency.

Mr. E. D. SMITH: I am sure we all feel as Mr. Jones does in regard to the great loss this country has sustained in the death of Dr. Fletcher. He was not only eminent in his profession but a most charming friend and con-

versationalist. As a lecturer, he had the faculty of imparting his information in a pleasing, plain and practical way, which is often lacking in persons who present technical subjects. We shall for many years feel his loss.

Little Peach Disease.

Moved by G. C. Brown, Fonthill, seconded by Robert Thompson, "That it is the opinion of this Association that the disease known as Little Peach should be added to the Act respecting Black Knot and Yellows, and that the same regulations should apply to the inspectors under the said Act as apply to inspectors under the San Jose Scale Act."—Carried.

Grand Trunk Railway Fruit Sheds, Toronto.

Moved by Wm. Armstrong, Queenston, seconded by Murray Pettit, Winona, "Resolved that we forward our thanks to the Grand Trunk Railway authorities for renovating and enlarging their old Scott Street fruit freight shed in the City of Toronto, all of which is greatly appreciated, especially by the commercial fruit growers of the Province."—Carried.

Moved by E. D. Smith, seconded by Jas. E. Johnson: "That the Department be asked to increase still further the number of inspectors for apples, and also to supply two or three inspectors to carry out the Fruit Marks Act in regard to tender fruits in the Niagara fruit belt, and in other tender fruit districts."—Carried.

A. McNeill, Fruit Division, Ottawa: In compliance with the demands of the fruit growers, the Department made a very considerable increase in the staff of inspectors this year, two of whom worked almost exclusively in the Niagara district.

Mr. Smith: I never heard of them.

Mr. McNeill: Nevertheless they examined much of Mr. Smith's fruit, and we have their reports to show it. These inspectors are in a measure detectives, and have been working at the most effective points, the fruit having been examined in large quantities.

Mr. Pattison: There is a great objection to secret methods. Much of the fruit is examined at Toronto, and this fails to accomplish what we desire. We want it examined at the point of shipment. It is publicity that is wanted. The Department is making a very great mistake in adopting secret methods. One of the greatest drawbacks to the local buying and order system is that they cannot depend on getting an honest quality of fruit. A buyer is so busy that he cannot look after each shipment himself.

Mr. McNeill: That is simply asking the Government to assist the buyer by looking after the individuals from whom he buys. You cannot expect that. A man must look after the shipments himself or stand the consequences.

THE WESTERN PROVINCES AS AN OUTLET FOR ONTARIO FRUITS.

By J. W. Crow, O.A.C., Guelph.

Accurate or even approximately correct figures on the quantities of fruit shipped to the western provinces year by year are difficult to obtain. Transportation companies and shippers are in possession of the only sources of information on matters of this kind, and these are not often open to public inspection.

I am indebted to Mr. Charles F. Roland, Development and Industrial Commissioner for the City of Winnipeg, for the following estimate of the total quantities of fruit received in that city from all points during 1907. Fruit from Ontario and from the central United States is usually distributed throughout the prairie provinces from Winnipeg and is included in this estimate. These figures do not include, however, large quantities which enter these provinces from British Columbia, Washington, Idaho, Oregon and California, and which is distributed from Regina, Brandon and other points west of Winnipeg.

"Fruit received in Winnipeg in car lots from all points during 1907:—48 cars of strawberries; 430 cars of tomatoes; 680 cars of peaches, pears and small fruits other than strawberries; 600 cars of oranges, and upwards of 1,000 cars of apples. Large as these receipts may appear, you can judge that the receipts will be even double in a very few years, as the population of Winnipeg has grown from 67,000 in 1904 to 118,250 in 1908. I am informed that over seventy per cent. of these receipts was consumed locally."

The proportions of fruit received from different points and handled in Winnipeg are estimated by the McNaughton Fruit and Produce Exchange as follows:—

California, Oregon, and other northwestern States	50 per cent.
Ontario	35 per cent.
British Columbia	15 per cent.

Mr. A. Mallinson, who has this season bought very largely in Ontario for western firms, estimates the total quantities of fruit shipped to the West from Ontario this year as follows:—

83,500 barrels apples, including a few boxes, estimated at three boxes per barrel.
220 car-loads of grapes, estimating 2,400 six-quart baskets as one car-load.
73 car-loads of tomatoes, pears and canteloupes.
Included in the last item would in some cases be a few baskets of plums, and a few peaches went forward also.

Mr. A. Gifford informs me that fully 20 per cent. can be added to the above estimate of total shipments. Mr. A. Mallinson states further that shipments of fruit from Ontario to Winnipeg have increased fifty per cent. during the last five years, and fully one hundred per cent. in the last ten years.

From a communication received from Mr. A. McNeill, Chief of the Fruit Division, I quote the following, with reference to the apple trade of 1907:—

The North West Transportation Co. handled	100.253 bbls.
The C. P. R. handled	18,720 "
Other boats handled about	10,000 "
	128,973 "

The G. T. R. and American lines not known,—probably half the C. P. R.

These figures show beyond doubt that a large and growing market for fruit exists in the prairie provinces. They show also that large quantities of fruit are annually being marketed there. They fail to show, however, anything regarding the kind or quality of fruit most in demand in that market, and on this point a great many Westerners have most decided opinions. The writer had the pleasure of interviewing large numbers of people at Winnipeg Fair this year regarding Ontario fruit matters. The opinions obtained regarding the grading and branding would have delighted

the heart of a British Columbia or Oregon shipper, but they surely operated to humble the pride of an Ontario shipper in the quality of our goods and in the honesty of certain of our citizens. A very large number of Western people know from experience on the old homestead in Ontario of the quality of fruit produced here. They will tell you emphatically, however, that since residing in the West they have too often been unable to secure value for money invested in fruit from the home province. They will tell you that in order to get what they pay for they are compelled to purchase the honestly marked and attractive packages from British Columbia, Oregon and other western points. This condition of affairs it must be admitted is not universal, but it is nevertheless far too common. It is unfortunate that we have in Ontario careless, ignorant, or dishonest growers and shippers, as our hitherto enviable reputation has suffered severely at their hands. One hears, too, of wilful unscrupulousness at the other end of the line, and it must be said in fairness to Ontario men that not all the fault lies at their door. In some cases, if one can believe all one hears, western receivers have encouraged misbranding of goods by such advice as this: "Send on your No. 1's if you have any; if you have none, send on your No. 2's, and either change the brand yourself or leave it to us to make No. 1 stock out of it." This is not intended as an arraignment of all fruit shippers and handlers, and the honest men in the business (fortunately they are in the majority) will not take it as such. There can be no good reason, however, for trying to hide the real state of affairs, and one learns with pleasure of a very radical change which has taken place this season in the methods of transacting business. Representatives of western firms have this year bought very largely in Ontario on the f.o.b. plan, subject to inspection by the buyer at shipping point. This method has given entire satisfaction both to the buyer and the seller. As evidence of the fact that the western consumer desires fruit of first quality and that a suitable article can be procured in Ontario, we may say that the Norfolk County and Forest Co-operative Associations have sold 14,000 and 15,000 barrels, respectively, in this way this season. Prices secured were very satisfactory, and in this connection the fact is worthy of note that the Westerner is a free buyer and is more willing to pay a good price for an article which suits him than is any other class of customers within our reach.

As further evidence of the wisdom of careful grading and honest branding, the following is quoted from a communication dated November 3rd, 1908, received from a Winnipeg firm: "We had three cars from the Georgetown Fruit Growers. The first car made them very little money; the second improved quite a little, the buyers getting next to the brand, and the third car sold to good advantage. It was fifty per cent. No. 2 and is going to net them back $2.35. We are using this to show what it means to the shipper to have stuff properly graded, packed and branded. We have other shippers who marked their stuff No. 1, and whose apples will average them from $1.00 to $1.50 per barrel. This is my best explanation regarding packing, grading and branding."

Other problems which relate themselves to this subject are those connected with transportation rates, express, and freight service and the customs tariff. In point of time Ontario is nearer Winnipeg than are California, Washington, Oregon, and British Columbia. The new route of the C.P.R. places Winnipeg within thirty-six hours of Toronto by express. British Columbia shipments reach the same market in three days. The same rate of charges is paid in either case, $2 per 100 pounds, in carload lots and $2.40 in part car lots. By freight the average time from Ontario points to

Winnipeg is five and three-quarter days, while from Oregon and British Columbia the time required is from six to eight days. The freight rate from points in Ontario to Winnipeg on fresh fruits in boxes, baskets or barrels and also on vegetables when shipped as part carload of fresh fruit is 66 cents per 100. To Brandon, the rate is 86 cents and to Regina $1.26. On straight carloads of apples in either boxes or barrels, the following rates apply from Ontario points to the West: To Winnipeg 55c., Brandon 68c., and Regina 83c. The foregoing tariffs are for all-rail shipments. By lake and rail, the following rates apply: To Winnipeg 48c., and to Brandon 61c. From points in British Columbia to Regina, Brandon and Winnipeg, I am informed that a flat rate of $1 per 100 pounds applies. From points in Washington and Oregon along the O. R. & N., the rate to Regina is $1.24 per 100 pounds. From these points to Winnipeg there is a competitive rate of $1.18.

Our Western competitors for the markets of the Prairie Provinces enjoy no advantages in the way of transportation facilities. The ventilated or "blower" express cars are in common use here as well as there and are very satisfactory. It is felt, however, that the rates charged on Ontario shipments are rather out of proportion to those asked of British Columbia shippers. For shipment by freight of summer and early fall fruits, including early apples, refrigerator cars are used. Excellent results have been secured by pre-cooling this class of goods, and for long distance shipments in warm weather this operation is coming to be regarded as essential. Mr. Robert Thompson, manager of the St. Catharines (Co-operative) Cold Storage and Forwarding Co., states that peaches handled in this way can be laid down in Winnipeg in good condition and at a moderate cost. Large quantities of apples go forward during favorable weather in the fall in ordinary box cars. After November 1st, however, there is danger of frost, and refrigerator cars are again resorted to. A sufficient supply of these is not available at this season, however, and as a consequence heavy losses often occur. From a circular issued by the C.P.R. to shippers and consignees, I quote the following regarding the handling of green apples, via lake and rail from Eastern Canada to Manitoba, Saskatchewan and Alberta:—

The Canadian classification provides for the carriage of green apples at owner's risk of freezing and prepayment of charges between 1st November and 30th April.

Notice is hereby given to connecting steamer lines, shippers and consignees that the railway companies will not assume responsibility for damage to green apples by frost, delivered to them at the above ports (Duluth, Fort William, Port Arthur, and West Superior), at the head of the lakes, on and after 1st November, nor will the railways guarantee to furnish refrigerator equipment for all such traffic, it being impossible to do this owing to the practice of combining the shipment to a short period late in the season. Railways will, however, as far as possible, supply refrigerator cars and permit the owners of such apples to equip these cars with their own means of heating. When box cars are used, the owners will also be permitted to line and place stoves or other means of heating in them, providing that in so equipping the cars with heating apparatus, damage will not be caused to cars. The railway companies will also furnish free transportation for attendants accompanying cars for the purpose of looking after the heating and will return such attendants to the starting point free of charge.

As a matter of fact, a shortage of cars usually exists by the all-rail route as well. It is, of course, practically impossible to equip a box car with heating equipment sufficiently to render shipment in cold weather reasonably safe. Refrigerator cars themselves are not safe in severe weather, and it will be one of the problems of the future to devise methods of avoiding frost injury to the late fruit intended for distant markets.

Mr. A. C. Macpherson points out that at the present time the export trade is receiving favors in the way of relief in icing and cold storage charges from the Dominion Government, and that interprovincial trade would also seem to merit similar encouragement.

Following is a statement of the customs tariff at present in force on fresh fruits entering Canada from the United States:—

Bananas, plantain, pineapple, etc., free.
Oranges, lemons and limes, free.
Blackberries, gooseberries, cherries, strawberries and currants, the weight of the package to be included in the weight for duty, 2c. per lb.
Cranberries, plums and quinces, 25%.
Peaches, weight of package included, 1c. per lb.
Grapes, 2c. per lb.
Pears, apricots and nectarines, 50c. per 100.
Apples, per barrel, (3 boxes estimated at 1 bbl.), 40c. each.

From a letter recently received from Mr. E. D. Smith, I quote the following:—

"The west is an outlet which enables us to very largely increase our acreage in many lines of fruit. Our chief difficulties are the high express rates and the low duties. If we had high duties or low express rates, we could capture nearly the entire western trade for peaches and plums, which would amount to hundreds of thousands of dollars annually; but betwixt the low duties and the excessively high express rates we are seldom able to compete with California peaches and plums laid down there by freight under a low duty. In grapes we have a high duty amounting to practically 200 per cent. What is the consequence? The consumers are able to buy grapes as low as 1½c. per lb., so they are not hurt very badly by the prohibitory tariff. The consequence is, however, that we are able to grow sufficiently broad acreage to supply the entire want of the Canadian public from ocean to ocean. That is the way it should be in peach and plums. On articles such as grapes, pears, and apples, which we can lay down by freight in the Northwest, we have no difficulty in competing except in the early part of the season. Even in these fruits with higher duties we would secure a greater share of the market, which would mean our ability to plant increased acres and not hurt the consumer one iota if our fruits are in the market."

A careful summary of western market conditions, competition, and transportation problems cannot but lead one to the conclusion that the western market logically belongs, in great measure at least, to Ontario. It only remains for Ontario men to come to an appreciation of the opportunities which are opening to them in that vast new country, and to make united and intelligent effort in order to secure their proper share of that important trade.

REPORT

OF

FRUIT BRANCH

Department of Agriculture

ONTARIO

1908

Published by the Ontario Department of Agriculture, Toronto

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. Cameron, Printer to the King's Most Excellent Majesty
1909

Printed by WARWICK BROS & RUTTTER, Limited,
TORONTO

To the Honourable JOHN MORISON GIBSON, K.C., LL.D., ETC., ETC., ETC.
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Fruit Branch of the Department of Agriculture for 1908.

Respectfully submitted

JAMES S. DUFF,
Minister of Agriculture.

Toronto, 1909.

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REPORT OF THE FRUIT BRANCH.

1908.

To the Honourable Jas. Duff, *Minister of Agriculture.*

Dear Sir,—I beg to transmit herewith for your consideration my first report of the work carried on by the Fruit Branch of the Department of Agriculture. Up to March of last year the horticultural and agricultural work was supervised by myself in connection with other Departmental business. At that time I was acting as secretary of the Fruit Growers' Association, the Bee-Keepers' Association and the Ontario Horticultural Exhibition and in charge of the inspection work under the San Jose Scale Act and any other horticultural work coming under the charge of the Department. The work had grown so rapidly, however, that it was felt that a special branch should be established in March, 1908, to which I was appointed Director.

The expenditure under this Branch during the past year as given in the Public Accounts of the Province was as follows:

Salaries	$ 1,833 29
Contingencies	1,198 17
Association grants	5,950 00
Experimental Fruit Stations	16,446 33
Grants to Spraying Associations	4,240 54
Inspection of Apiaries	2,085 21
San Jose Scale	3,363 66
Exhibitions	2,457 20
Canadian National Exhibition	770 02
Royal Horticultural Exhibition	2,453 65
Capital Expenditure, Ontario Horticultural Experiment Station	18,909 00

These items of expenditure will give some idea of the lines of work undertaken during the season and will be elaborated upon in the following pages, where details are given of their carrying out.

Your obedient servant,

P. W. HODGETTS.
Director.

REPORT OF THE FRUIT BRANCH.

FRUIT GROWERS' AND BEE KEEPERS' ASSOCIATIONS.

Under the item of grants, these two associations are allowed for their work the sums of $1,700 and $450, respectively. The money is spent chiefly for the promotion of organization among the fruit growers and the bee-keepers and for the holding of annual meetings of these two bodies of agriculturists to which are brought the best speakers in America. These gatherings are of great importance, bringing the producers of various parts of the country into touch one with another.

Realizing the necessity for awakening our apple growers to the value of more thorough spraying for the Codling Moth, the Fruit Growers' Association, through this office, issued a small pamphlet entitled "Success in Spraying." This was very widely distributed throughout the country, and from reports received during the year, a great deal of interest was awakened by the information contained therein.

The formulae and spraying methods in use by three of the best apple growers in the Province were given in full, with a brief comparison at the end as to the differences between them. Mr. Jas. E. Johnson, of Simcoe, uses the following formula:

"First spraying when buds begin to swell with 20 lbs blue vitriol; 70 lbs lime; 200 gallons of water;

Second spraying just before buds break open, and third spraying just as soon as the blossoms fall, with 16 lbs. blue vitriol, 12 ozs. Paris green, 12 ozs. white arsenic, 2½ lbs, sal soda, 70 lbs. lime, 200 gallons water.

"Fourth spraying, if troubled with Tussock Moth, when the young begin to feed upon the new wood, spray same as in second and third sprayings, except use 12 lbs. blue vitriol instead of 16 lbs. to 200 gallons water."

Mr. D. Johnson, of Forest, uses the Paris green only for poisoning the liquid, and the ingredients are mixed in the following proportions:

200 gallons water, 16 lbs. copper sulphate, 24 lbs. lime, 16 ozs. Paris green.

Mr. Harris, of Ingersoll, the third party whose methods were outlined uses the following formula:

160 gals. water, 24 lbs. copper sulphate; 28 lbs. lime, 32 ozs. Paris green.

While it is found that these mixtures differ somewhat, the results were uniformly good. There is no doubt whatever that the success of these men has been due to the thoroughness with which the mixture has been made and applied. There has perhaps been too much emphasis in the past put upon the necessity for getting a very fine, mist-like spray, and in consequence neglecting to apply enough of the mixture to get the desired results.

In speaking of the amount of material required, Professor Melander, of Washington, who has been very successful in his spraying, states that a well-grown tree will absorb from 5 to 10 gallons of the mixture at a spraying.

Realizing that the co-operative fruit shipping associations, organized by the Provincial association would require every assistance possible for the marketing of their fruit, the Directors of the Provincial Association organized what is known as the "Co-operative Fruit Growers of Ontario." This

association differs from the other Provincial association in that its aims are entirely commercial. It is supported by a small fee from each association, and endeavors to keep the local associations in the various parts of the Province in close touch with each other during the fruit season, from July to December. During that time a weekly report is issued giving lists of sales, prices being obtained for apples and other fruits, amount of fruit available from the different associations and from other parts of the country, general conditions existing in the important apple markets of the world, etc. In addition, special price lists are sent out in the spring giving wholesale prices for chemicals, spraying supplies, ladders, boxes and barrel stock and made-up packages, ets. Through this association, we believe that a great number of the smaller organizations have been helped to reap a larger profit from the sale of their fruits than would otherwise have been the case.

In the reports of the Fruit Growers' and Bee-Keepers' Associations, which are issued separately by the Department will be found further information in reference to the work carried on.

EXPERIMENTAL FRUIT STATIONS.

A detailed statement of the work carried on at the individual stations will be found in the following pages of this report. The work of inspection was undertaken by Mr. H. S. Peart, Director of the Horticultural Fruit Station at Jordan Harbor, and myself as such times during the year as we thought best.

In addition to the regular experiment stations, some special investigations were carried on by Mr. A. McKenney, district representative at Essex, in connection with tobacco, onions, and spraying mixtures for the San Jose Scale. A detailed account of the experiments with onions and spraying mixtures is given in this report. The tobacco experiments were not conclusive and this work has since been taken up by the Dominion Government which has established a special tobacco experiment station in Essex county. Further tests in reference to the effect of fertilizers on onions and other vegetable crops will be made the coming year in a special piece of ground on the Leamington marsh leased by the Department.

These spraying experiments will be continued by Mr. McKenney, so that definite announcements can be made as to the effect of the various chemicals, both home-made and commercial, which are being advocated throughout the Province.

The cranberry experiments, a report of which follows, were begun in the spring of the past year. As it will take three years for the bushes to come into bearing, nothing definite can be decided as to the value of this crop from the Ontario standpoint for two seasons. In the meantime, it is the intention of the Department to make further plantings at other points which may be thought suitable for the growing of these crops. From Mr. McMeans' report it will be found that a great deal can be saved to the Province if the fruit which we are now importing can be raised here.

The following is the report on the individual stations:—

G. C. Caston, Craighurst.

This station, known as the hardy apple and cherry station in Mr. Woolverton's list, was visited during the apple picking season. Mr. Caston has a large farm with a lot of good fruit set out for experimental and commercial work. His soil is light and sandy and seems to be specially well

adapted for the raising of early, hardy apples, such as Alexander, Wolfe River, etc. He has also raised large quantities of blackberries and raspberries and has a big plantation of these at the present time. His farm was in good condition and showed signs of careful tillage. The experimental cherries have been pretty well weeded out so that there are practically none left except the very hardiest, such as Russian 207, and Orel 24. The apples are in rather better shape, although a great many have been killed out. Here, too, the hardy apples are the only ones that are showing up well. Mr. Caston has great faith in top-working varieties and has some very healthy Spy and other kinds coming on at the present time in this way.

A. E. Sherrington, Walkerton.

This station was also visited during the apple picking season. Although he is supposed to experiment with raspberries, gooseberries and plums, we find that his apple plantings are at the present time his best experimental work. The experimental raspberries are about done and any new plants which Mr. Sherrington has put out are for commercial purposes only. His plums are in rather better shape than any of the experiment stations that we visited and many varieties have survived here which were entirely wiped out at Clarksburg.

We found the experimental apples in fine condition, the trees being very vigorous and healthy and coming nicely into bearing, a great many of them having been planted from 10 to 12 years. As yet we have received very little records of yields from these trees and they are now at their best.

The pear orchard containing a collection of the French varieties is practically cleared out. A young cherry orchard of Early Richmond, English Morello and Montmorency was found to be in good condition. A new plantation of blackberries, raspberries and strawberries has been set out, but no further experimental work.

The condition of the whole farm was excellent. It is almost all planted in fruit with 8 or 10 acres in full bearing apple orchard. The section promises to be one of importance as an apple growing district, Mr. Sherrington should be able to render valuable assistance to his own and neighboring counties.

During the coming season he will carry out a number of special experiments in the use of commercial fertilizers for small fruits and various spray mixtures for control of the codling moth and scab.

J. L. Hilborn, Leamington.

This station was started two years ago to specialize with peaches. Owing to the very disastrous frosts in the Essex Peninsula, the orchards there which were of very great importance were almost completely destroyed, and it was felt that something should be done to encourage the growers to replant. We found Mr. Hilborn's farm in splendid condition and excellently situated for the purpose for which it was intended. Mr. Hilborn has shown his faith in the district by replanting peaches despite the unfavorable conditions of the past few years. His experimental orchards are, of course, just started, and no results from these can be expected for a short time yet. There was a very fine peach orchard of five years standing on the farm and this showed what could be done if the frosts can be evaded. In addition to the peaches, Mr. Hilborn has a small plot of experimental gooseberries and

currants. He is also largely interested in the forcing of early tomatoes, cucumbers, etc. An illustration is given of part of his houses which are built in such a way as to ensure efficient ventilation, ease in changing the soil in the benches and cheapness of construction.

A. W. Peart, Burlington.

Mr. Peart's specialties were blackberries and currants. We found there that he had given these complete tests and had cleared out his experimental plantations as nothing further could be obtained from them.

In addition to this fruit, Mr. Peart was given a large number of southern varieties of apples to test. These were top worked on his commercial orchard but have proved to be of very little value, most of them having fruited and have been reported as useless.

The farm is situated in one of the best fruit districts of the Province and was found to be in very good condition. The apple orchards showed up magnificently. In addition there were on the place, fine pear and cherry orchards and a good vineyard.

Mr. Peart states that he has come to the end of his experimental work with small fruits and does not feel like continuing it under present conditions. He feels that the Jordan Station could well undertake the work that he was carrying on with the experimental small fruits and has accordingly tendered his resignation. Mr. Peart deserves the highest praise for the careful and detailed reports which he has submitted, of the work carried on by him for the Department.

L. Woolverton, Grimsby.

This is what is known as the "Maplehurst" Station, and contains a general collection of cherries, peaches, grapes, pears and plums for comparative study and for use in preparing the "Fruits of Ontario." Mr. Woolverton's specialty was cherries. In a recent letter Mr. Woolverton states that he still has a complete collection of grapes and pears and nearly all of the peaches, but that he has taken out the plums. This place was visited by Mr. Hodgetts during the cherry season, and by Mr. Peart during the apple and pear season.

M. Pettit, Winona.

Mr. Pettit has devoted most of his time to the testing of grapes, although he has also been given some varieties of plums for testing. This station was seen at several times during the season, and was always in the best possible condition. Mr. Pettit is recognized as one of the best authorities on grapes in the Niagara Peninsula, and we believe that the results of his experiments have been of great value to that section. Mr. Pettit will conduct during the coming season some extensive experiments in the control of the grape rots and mildews.

H. Jones, Maitland.

This station, under Mr. Woolverton's list is marked for testing the hardy plums and pears. We find, however, that the plantings of these fruits have practically all been destroyed. Mr. Jones has evidently exercised a very great care in nursing all these varieties right up to the very last, but has

been able to hold very few of them over. This applies especially to the pears. The few varieties that are left are receiving every attention, and Mr. Jones hopes yet to make something out of them.

In addition to this fruit there are quite heavy plantings of apples of which there are a number now in bearing. Mr. Jones has been working with apples to secure a good winter variety and some of these that he has in bearing show considerable promise. The illustration shows a tree of Milwaukee which is probably one of the best of these varieties.

His farm as a whole was in good shape. The old commercial orchards of Fameuse and Scarlet Pippin show signs of the severe winters of late years, but despite this, the broken limbs and trunks bore a large crop of fine apples the present year. Mr. Jones has a number of young orchards also on the farm which are coming on nicely. Mr. Jones will co-operate in the future with Mr. Macoun, of the Central Farm, in the testing of the varieties which have been originated there.

E. E. Adams, Leamington.

This station was started two years ago for the testing of vegetables. The Leamington section has become noted for the area which is being devoted to truck crops, and Mr. Adams has made this largely his business. We found the farm nicely situated in the heart of this district and everything was in excellent condition. At the time of our visit Mr. Adams was shipping large quantities of melons to the upper lake ports. He seems to be specially fitted owing to his business training to market his crops to the best advantage. Everything was put up in neat form and was bringing the top prices in the market.

In connection with this work, we find that there are several of our most important districts entirely unrepresented at the present time. Among others, there is the section east of Toronto comprising the counties of York, Ontario, Durham, Northumberland, Hastings and Prince Edward, the finest apple section in the Province. Then west of Toronto, there is the district comprising the counties of Lambton, Middlesex, Oxford, Brant, and in the south that composed of Welland, Haldimand, Norfolk and Elgin. In the first section we would suggest that instead of starting new stations as in the past to test varieties, we utilize the services of the two Department representatives, Messrs. Hare, of Whitby, and Winslow, of Picton, for this work. If necessary, orchards in the vicinity of these places could be leased for this purpose. In the other sections, we would like to see the work carried on in the same way provided representatives could be appointed to some of the counties in each district.

We find that in very few cases have the surrounding districts shown much interest in the station and we would recommend that some special effort be made to bring the results of the labors of the experimenters before the people living in the immediate vicinity. These are the ones who should benefit most by such work, but up to the present have gained very little from it. We would suggest that the local fairs in the counties surrounding each station be arranged in a circuit and the representative in charge of the experiments be sent from place to place with instructions to hand out station literature and give as much information as possible to people inquiring for it.

SPRAYING OF ORCHARDS.

The bonusing of orchards sprayed under our system of inspection was continued this year with very gratifying increase in the acreage sprayed, and the number of parties taking advantage of the assistance rendered by the Department.

The regulations governing the grants for 1908 were somewhat changed from those of 1907. Instead of giving the bonus entirely to power spraying outfits, it was decided to distribute the money according to the acreage sprayed and the efficiency of the work done, regardless of the type of machine used. Those fruit growers who had participated in the previous year's grant were given only one-half of the amount given to parties spraying for the first time under our inspection last year.

The inspection of orchards in the Niagara district and eastern part of the Province was carried on by my assistant, Mr. T. B. Revett. Orchards in the western and northern counties were inspected by Messrs. M. S. Middleton and R. M. Winslow, of the Agricultural College. Two visits at least were

Steam Cooking Plant on the Farm of Alf. Griffith, St. Catharines.

made to every orchard and separate reports made on the spraying, the cultivation, and general care of the orchard, and the condition of the crops. In November, a special report blank was sent out to all of the parties who had sprayed, asking for further information as to the spraying, the crops produced and prices at which the various fruits were sold, and the insects or fungous diseases which had caused material damage during the season.

In the districts infested with the San Jose Scale, the bulk of the spraying was done with the lime sulphur mixture. This remedy is now used almost entirely for the treatment of the scale and better results are being obtained than when the mixture was first introduced through the advice of Mr. Geo. E. Fisher. The general difficulty lay in the boiling of the ingredients. Mr. Fisher advocated, with splendid results, the use of the traction engine to furnish steam for this boiling. Such method was followed very largely until the past two seasons, when simpler devices were used. A number of illustrations are given in this report showing a few of the forms adopted. These are very efficient, boiling the mixture in less time than formerly and mak-

ing use as fuel of the prunings of the orchard which would otherwise be wasted.

The simpler outfits for a plant holding from 100 to 200 gallons can be erected for from $10 to $15. These are constructed with a brick or cement foundation covered by a box made of 2-inch plank. The bottom of the box is made of sheet iron, 16 guage or thicker, double nailed to the frame work. An outfit 6x2½x1 ft deep will hold 100 gallons giving plenty of room for

Handy Cooking Plant of 200 Gal. Capacity on Farm of E. Hack, St. Catharines.

the boiling. There is not the violent boiling and spluttering of the mixture with these outfits that there is with the steam plant, and the same allowance need not be made for this in the depth of the sides. An outfit for making 200 gallons is also illustrated. This is 6½x4x1 ft. deep. Two iron rods are run across the ends in all cases to hold the frame work rigid.

Where a man has a great quantity of fruit to spray, or intends to supply his neighborhood with the mixture, the larger outfits using steam for the cooking are still the most commendable. Illustrations are given of three of these plants at different points throughout the Niagara district. That on the Sanford estate at Hamilton has a capacity of 290 gallons in the two tanks.

Small Cooking Plant, 20 Gal. Capacity, on Farm of Robt. Locke, St. Catharines.

The boiler outfit cost $100. The capacity of the other machines can be guaged through the number of barrels in use. With these machines, the necessity of having convenient access to a supply of water is very essential. On Mr. Bunting's farm, a wind-mill and tank give the necessary supply, while on the Sanford estate, a steam injector draws the water from a near-by

creek. In the other instance, a thresher's pump is mounted on a large tank and both the engine and the barrels are supplied with water from a near-by stream.

The Department of Agriculture first gave a bonus on spraying in 1907. In that year the grant was given at the rate of $50 for every power sprayer owned and operated by a co-operative society of five or more members spraying at least 25 acres to every machine. As a result of this bonus several associations were formed and power machines installed. $4,000 was distributed to 36 societies and the following acreage was sprayed: Apples, 1,478½ acres; pears, 167½acres; plums, 334½ acres; peaches, 604 acres; grapes, 574¾ acres; cherries, 43 acres, making a total of 3,201½ acres.

Serviceable Cooking Plant for Lime Sulphur on Farm of Robt. Thompson, St. Catharines.

In the Niagara district there were 45 spraying machines in operation, in South-western Ontario, 16; in Eastern Ontario, 13; Western Ontario, 6. 201,320 gallons of lime and sulphur wash (prepared from 76,551 lbs. sulphur and 104,922 lbs. lime) were applied and 261,280 gallons of Bordeaux, consisting of 33,760 lbs. copper sulphate and 32,058 lbs. of lime, 1,466 lbs. Paris green and 565 lbs. arsenate of lead. This makes a total of 462,600 gallons of spraying material used in the Province that came under the direct inspection of the Department through these associations.

It will be noticed that the greater part of the spraying was done in the Niagara district. This is due to the fact that the land there is given up mostly to fruit growing, and these fruit growers have realized that in order to protect their orchards from such pests as the San Jose scale, codling moth and the various fungous diseases they must spray. This awakening resulted in a general campaign in favor of spraying, and as a result the acreage of fruit sprayed has increased every year and the work is improving as the growers become more conversant with the mixtures.

The spraying on the whole was done very creditably. There were instances where the work was not very thorough, but in most of these cases the apparent neglect was due to a lack of knowledge in regard to spraying.

Under the regulations of 1908 there were 42 associations who received the grant. Their total membership consisted of 552 growers spraying a total acreage of 4,781½ acres of fruit, an increase of 1,580 acres over the

Steam Cooking Plant on the Farm of the Sanford Estate, Hamilton.

total amount sprayed the year previous. The increase chiefly took place in the Niagara, Norfolk and Kent districts.

Mr. Revett reports as follows in regard to the season's observations: The growers generally took greater interest in the work than in 1907, and where there had been mistakes they took every precaution to prevent their recurrence. They seemed also to appreciate the fact that they had the opportunity once or twice during the season of discussing with the officers of the Department the different obstacles with which they were confronted. The greatest fault with which I met was that the fruit grower would in most cases apply too little mixture to his trees. This was partly due to the fact that they had been taught in the past not to put on too much to cause dripping. However, this error diminished as the grower became more conversant with spraying and realized that while economy was necessary, thoroughness should not be sacrificed for the sake of this factor.

Bordeaux Mixture. Bordeaux mixture was used more than any other spraying material. I found a great deal of variation in its preparation. Many of the growers had the idea that it was wisest and best to use a great excess of lime and in many cases large quantities were used. They contended that it minimizes the toxic effect of the copper sulphate, and increases the sticking powers of the Bordeaux. This idea is erroneous. An excessive amount of lime over the general formula is useless as it makes a coarser mixture, which is harder on the pump. It tends to delay the action of the copper salts which might happen at a time when this action is required, and is said to offer a greater mechanical resistance to the rain and in this way is more easily washed off. It is sometimes held that where the calcium arsenite is used as the poison that the lime in excess is an advantage, but there should be no excess of soluble arsenic if the poison is prepared properly and the excess of lime in the standard formula should be great enough to deposit the soluble arsenates as calcium arsenites.

We also find a varying percentage of bluestone used. The amount recommended in the old formula was 4 lbs to 40 gallons water, and while the greater number stuck to the formula, yet we find some growers using 5 lbs. to 40 gallons. The question of varying the strength of the copper sulphate has attracted considerable attention of late, owing to the russetting of apples which is technically known as Bordeaux injury, and it has been practically proven that the increase of degree of injury corresponds with the increase of percentage of $CuSO_4$ in the Bordeaux mixture. We find a large number of our fruit growers lessening the amount of bluestone and in some instances better results have been obtained where 3 lbs. of $CuSO_4$ had been used.

Bordeaux mixture was in most cases poisoned either by Paris green, arsenate of lead or calcium arsenite. Paris green was at one time universally used as a poison, but within the last two years, the growers around the St. Catharines district are using large quantities of the lead arsenate together with fair quantities of the other arsenical poisons, while the growers around Simcoe, in the County of Norfolk, use calcium arsenite almost entirely. Excellent results have been obtained by the use of these poisons. Paris green is still used, largely for the simple reason that the growers do not like to change from a substance they are familiar with to a new one. There is, however, a growing tendency to use the lead arsenate or calcium arsenite in place of Paris green. Lead arsenate has given splendid results. It is a trifle more expensive than Paris green, but the growers who have used it have had such good results that they prefer it to Paris green.

Calcium Arsenite. This poison is better known by the fruit grower as white arsenic. It is prepared by them on the farm by the use of sal soda, arsenic and lime. The general formula adopted is as follows: $\frac{1}{4}$ lb. arsenic, 1 lb. sal soda boiled for 45 minutes and precipitated with 2 lbs. lime to 40 gallons water, forming calcium arsenite.

Mr. James E. Johnson, Simcoe, poisons his Bordeaux by the use of calcium arsenite and Paris Green. He boils 12 oz. arsenic with $2\frac{1}{2}$ lbs sal soda in 2 gallons of water for 45 minutes. He then pours this mixture in 200 gallons of Bordeaux and then adds 12 oz. Paris Green. This method produces exactly the same result as a grower who only used the white arsenic to manufacture the calcium arsenite while Mr. Johnson's method is more complicated and expensive and attains exactly the same results. However, the results which have been attained by the Norfolk fruit growers have been very excellent in the treatment of the codling moth. Throughout the Province the general knowledge amongst the fruit growers of the pre-

paration of Bordeaux has improved wonderfully, more attention being paid to its preparation and application with the result that the degree of success has been more uniform than in past years.

Lime Sulphur Mixture. The use of lime and sulphur is chiefly confined to those districts in which the San Jose scale is found, namely the Niagara district and Southern Ontario. It is a splendid remedy for the scale and gives good results when used as an fungicide. Within the last three years the fruit growers of the Niagara district have carried on a vigorous campaign against the San Jose scale with the result that nearly every fruit grower uses lime and sulphur and knows a good deal about the preparation. The first step was made by the fruit growers in certain localities combining together to build a plant for the manufacture of this wash so as to produce a

Double Form of Cooking Plant on Farm of J. H. Broderick, St. Catharines.

uniform and economical mixture. Many of these plants sprang up in this district which had the immediate result of supplying the fruit growers' need and of inducing growers who would not make their own mixture to spray as the wash could now be had very conveniently. At these plants the wash was all boiled by steam generally supplied by a threshing engine. However, there were a few individual growers who made their own mixture by direct heat. This method is becoming very popular around St. Catharines, and I think it will eventually supplant the large boiling plants. Of course, the grower has to make his own mixture and to do it properly he must study and thoroughly understand the process and when this is the case, the grower generally does his own work more thoroughly and becomes a great believer in spraying and his results are more uniform and efficient.

This method has also the advantage of cheapness and does away with the waiting which would take place at a large co-operative plant.

The following is a description of a small lime and sulphur plant in which direct heat is utilized.

Two boxes 18 inches high, 4 feet 6 inches long; 2 feet, 9 inches wide using 1½ inch lumber. No. 16 iron plating is used for the bottom. 6 feet x 3 feet. This extra size allows the iron to be rivetted on the sides and in this way acts as a protection. These boxes cost $5.00 each.

The structure for holding the boxes may be made of brick or cement. The one shown is made of brick. It is made in two steps in order to allow the hot water to run from one box to the other. A fine grate which costs $2.00 is placed under the first box which is used to boil the wash, the heat striking this passes onward to the second and upper tank which is used to boil water.

Cost of plant.

2 boxes as per description, $5.00 each	$10 00
1 grate	2 00
Cost of building walls and finishing plant	13 00
	$25 00

Mr. J. H. Broderick, St. Catharines the owner of this plant writes as follows: "In making a batch of this lime-sulphur wash, I use 25 gals. of water, when boiling add 48 lbs. of lime and as soon as lime begins to slack well and the water boils freely, add 34 lbs. sulphur in paste form. Boil for an hour and add enough water from upper tank to make 80 gallons.

Cost of manufacturing 80 gals. of lime and sulphur wash with formula of 22 lime, 17 sulphur, 40 water:

Sulphur, 17 lbs. at 1.42 cts.	c.24 14
Lime, 22 lbs. at 25 cents bushel	7 85
Coal for fuel, 10 lbs. at $4.50 per ton	2 25
Labor	10 00
	c.44 24

In boiling this mixture, Mr. Broderick has only used the ordinary strength, but by doubling the solution a formula of concentrated solution could be made which when diluted from the upper tank would make 160 gallons of mixture which would lessen the cost of production about five cents per barrel of mixture, and if the lower box was found to be too shallow to allow the violent action of boiling, it could be made 22 inches deep, an increase of depth of four inches which would cost only a trifling amount.

This type of plant is a very economical one and gives excellent results. It should be located as near to the water supply as possible. The only drawback is that the mixture has to be baled out to the spraying tank. However, in some locations having a natural elevation of land this could easily be remedied. This drawback is not serious enough to detract from the value and suitability of such a plant to the majority of fruit growers.

The formula used for the lime and sulphur has changed a good deal. Three years ago the most used formula was 17 lbs. sulphur, 34 lime and 40 gals. water, but year before last and last year, the tendency was to equalize the amounts of lime and sulphur and the prevailing formula was 18 sulphur, 22 lbs. lime, 40 gals. water. The quality of the mixtures has greatly improved and a more uniform wash has been used with more satisfactory results. The lime and sulphur has been very effective on the San Jose scale and has been especially beneficial to peach orchards in the check-

ing of peach leaf curl, for while it does not entirely stop the curl in every case yet it checks the fungus, and the tree seems to come on very rapidly after the affected leaves fall.

One or two growers have used the home-made summer lime and sulphur wash in order to control fungus diseases. The formula used was 6 lbs.

Steam Cooking Plant for Lime Sulphur on Farm of W. H. Bunting, St. Catharines.

sulphur, 12 lbs. lime, 40 lbs. water, the mixture being self-boiled. In looking over this work I was unable to see any difference or any superiority of this mixture over the poison Bordeaux mixture.

There were several brands of the prepared lime sulphur sold in the Niagara district and a number of barrels of it used for experiment. The barrels were sold at $12.00 apiece and for winter spray were diluted either

1 to 11 or 1 to 12 which made the cost of material one dollar per barrel. Members of a co-operative boiling plant can produce their mixture at 75 cents per barrel which is 25 per cent. cheaper and those farmers that have their own plants, manufacture at a cost of 52 cents per barrel which is 48 per cent. cheaper. Under such conditions it is cheaper and just as effective for the growers to make their own mixture and save the difference. However, this factory prepared mixture has a place for there are many small growers who only having an acre or so of fruit and have no time to boil their own and will find this an excellent substitute. If the cost is reduced as has been promised, larger growers may also adopt this liquid spray in preference to the home-boiled.

Spraying Machines. In those districts where the fruit farms or apple orchards are of small acreage we find a tremendous increase in the number of hand pumps. These pumps are cheap, give excellent results and are very good for the small grower as he is able to get at his work at the right time and need not wait his turn as he would naturally have to do if three or four clubbed together to buy a power outfit.

Power Machines. There are several kinds of these machines, gasoline, gas and wheel power. In the gas machines the power is generated from carbonic acid gas in iron tubes and as these are somewhat expensive and hard to get, this kind of outfit is not being used in the province as much as when first introduced. The gasoline and wheel power outfits are quite numerous and the farmers who use them think them very satisfactory. The small wheel powers (80 gal. capacity) are chiefly recommended for grape spraying.

Insects. The San Jose scale (Aspidiotus perniciosus) is still one of the most destructive in Ontario, but owing to the better understanding of the preparation of the lime-sulphur wash and the more organized development of spraying we find the progressive fruit growers do not look upon this pest as a dangerous one. It is, however, doing a great deal of damage in south western Ontario especially in the apple orchards of Kent and Essex Counties, but the farmers of these districts have not taken up spraying thoroughly and the pest will increase until we have a development of spraying as we now find it in the Niagara district.

The Oyster Shell Bark Louse. This insect, although the easiest of the scales to treat his increased at a tremendous rate in eastern Ontario and has done inestimable damage to the apple orchards. Those growers who have realized the loss that would be caused by delay have taken the precaution to spray thoroughly with lime and lye solution (formula 30 lbs. lime. 40 gals. water, 2½ Gillett's lye) and have had excellent results.

The codling moth is still at the front and causes tremendous loss in southern and western Ontario and although it is found in eastern Ontario, yet it only has an early brood and is more easily combatted.

The cigar and pistol case bearers have been quite prevalent in some sections of eastern and western Ontario. The bud moth appeared in great numbers in some orchards of the Niagara district. The blister leaf mite is increasing rapidly in eastern Ontario. I first noticed it at Wicklow, but this year could find it in every orchard between Whitby and Trenton, the worst case appearing in an orchard situated 5 miles north-east of Cobourg. In this orchard some of the Baldwin trees were so badly infected that they presented a burnt appearance. As yet no spraying has been done for this insect in eastern Ontario. The lime and sulphur and the miscible oils have been strongly recommended by the authorities.

The tussock moth appeared to a serious extent in the apple orchards around Simcoe in Norfolk County, but will be easily controlled with poisoned Bordeaux.

Fungus Diseases. The apple and pear scab was not as prevalent last season as usual and caused much less damage. The twig and body blights of the apple were quite bad in eastern Ontario. The pear blight was also injurious and continues to do severe damage to the pear orchards.

Apple canker. I notice this throughout the apple section of the province. In some cases the damage was quite serious especially on the Ben Davis in eastern Ontario. The disease invariably seemed to follow the body blight.

Black rot of the grapes only appeared in one or two vineyards in the Niagara Peninsula and did not spread to any extent.

The *downy mildew* was somewhat prevalent during the early season of the ripening of grapes, but it only appeared to any extent in unsprayed vineyards or ones that had been carelessly sprayed.

Brown rot of plum and cherry. This year was remarkable for the scarcity of rot on the fruit, and the plum crop was handled without any material loss from that source.

INSPECTION OF APIARIES.

The expenditure under this heading was entirely for the services and expenses of the 8 inspectors who were engaged in the work during the past year. A full account of their work is given in the annual report of the Bee Keepers' Association for 1908.

SAN JOSE SCALE.

Under this vote are included the amounts paid to the various municipalities which appoint local inspectors under the San Jose Scale Act. Under section 4, sub-section 5, the Department agrees to refund one-half of the remuneration of such inspectors and the following municipalities received aid last year:—Townships of Barton, Clinton, Louth, Mersea, North Grimsby, Pelham, Saltfleet, Thorold, and the towns of Leamington, Thorold and St. Catharines. There are still a number of townships in the Province where the scale is prevalent that should pay more attention to the location and eradication of this pest. Upon the petition of 15 rate-payers, the council must of necessity appoint one or more inspectors, and the matter rests, therefore, largely with the fruit growers in each municipality, as to whether the orchards are to be properly protected in this way.

The work of inspection in connection with the nurseries has again been carried on as efficiently as possible. Mr. J. Fred Smith of Glanford had charge of the inspection of the stock, while Mr. T. B. Revett, of the Department looked after the carrying out of the fumigation regulations.

To still further guard the fruit growers, it was decided to appoint sub-inspectors at the leading points in the Niagara Peninsula where the bulk of the nursery stock is grown. It was the duty of these men to watch closely during the present season and see that all nursery stock was properly fumigated before being shipped out, and also to report any instance of scale found in the nurseries. Mr. A. E. Jones of Fruitland, supervised the fumigation in the territory from Hamilton to Vineland. Mr. Harry Arnold of Pelham Centre looked after the different nurseries in the Fonthill district, while Mr. H. Bunting covered the territory from St. Catharines to the Niagara River.

There are several instances of scaly stock being located and destroyed and a general inspection should be ordered during the coming season. The scale has not been reported from any new section during the year, and there is no doubt that this is altogether due to the fumigation which has been carried on in the past. In the Niagara Peninsula, however, the insect is gradually extending the infested area to the south over the ridge of land running through the district. There was also a great increase in the number of scaly trees reported from Essex and Kent Counties where spraying is not so general as in the other districts.

LIST OF NURSERYMEN GROWING STOCK IN ONTARIO.

A list of the nurserymen who are growing stock in the province is given herewith. There are numerous other firms doing business which obtain their stock from parties mentioned in this list. Four firms are given who are largely engaged in the seed business. These, however, raise more or less ornamental stock and small fruits such as currants, raspberries and gooseberries.

NURSERYMEN :

Morris & Wellington	Fonthill	General stock of fruit and ornamentals.
Brown Bros.	Brown's Nurseries	General stock, etc.
B. W. Secord	Pelham Corners	General stock, etc.
Jas. Page	Ridgeville	Fruits.
J. E. Crow	Ridgeville	Fruits.
A. G. Hull & Sons	St. Catharines	General stock.
J. E. McCombs	Pelham Corners	Fruits.
H. Cawker	St. Catharines	Roses.
C. E. Secord	St. Catharines	Peaches.
E. Morden	Niagara Falls	General stock.
W. O. Burgess	Queenston	Peaches and cherries.
Frank Walker	Virgil	Peaches.
E. D. Smith	Winona	General stock of fruit and ornamentals.
C. W. F. Carpenter	Winona	General stock of fruit and ornamentals.
J. W. Smith	Winona	Peaches.
W. B. Bridgman	Winona	Peaches.
J. E. Henry	Winona	Peaches.
J. E. Foran	Winona	Peaches.
G. M. Hill	Fruitland	General.
Jos. Tweddle	Fruitland	Small Fruits.
Brock Galbraith	Bartonville	Peaches.
Connon Floral Co	Hamilton	Ornamentals.
C. E. Woolverton	Grimsby	Ornamentals.
W. H. Bunting	St. Catharines	Strawberries.
H. P. VanWagner	Stony Creek	Dahlias and gladioli.
Thos. Rowley	Leamington	Peaches and grapes.
Frank McLean	Brigden	Fruits.
N. E. Mallory	Blenheim	Small fruits.
McDowell Bros.	Tillsonburg	Small fruits.
John Downham	Strathroy	Strawberries.
J. Gammage & Sons	London	Ornamentals.
C. A. Baker	London	General.
R. C. Chrysler	St. George	Strawberries.
W. H. Vanderburg	Poplar Hill	Strawberries.
M. Milgau	Bright	Evergreens.
Hunter & Sons	Scotland	Fruits and dahlias.
J. McAinsh	Wellburn	Evergreens.
Mitchell Nursery Co	Mitchell	Evergreens.
Campbell Bros.	Simcoe	Cannias, dahlias, gladioli, paeonies.
Jas. E. Johnson	Simcoe	Strawberries.
Wm. Fleming	Owen Sound	Small fruits.
J. H. Wismer	Port Elgin	Fruits.
Estate John Stewart	Ben Miller	Fruits.
J. W. Johnston	Campbellford	General.
L. K. Shourds	Wellington	Apples.
W. C. Reid	Belleville	Ornamentals.

LIST OF NURSERYMEN.—*Continued.*

NURSERYMEN:		
McIntosh & Smith	Mountain	Fruits.
J. W. Thompson	Napanee	Strawberries.
Ottawa Nursery Co	Ottawa	General.
David Tait	Iron Bridge, Algoma	Hardy fruits.
R. Brecken	Toronto	Small fruits and ornamentals.
Colin McDonald	Toronto	Small fruits and ornamentals.
Thos. Manton	Eglinton	Ornamentals.
SEEDSMEN:		
Steele Briggs Seed Co	Toronto & Hamilton.	
J. A. Simmers	Toronto.	
Wm. Rennie Co	Toronto.	
John A. Bruce & Co	Hamilton.	

Mr. Revett reports as follows in reference to this work:—

The planting of fruit trees and ornamental plants has been on the increase in Ontario where general prosperity amongst the farmers and good prices for their fruit has acted as a stimulus in encouraging the planting of more fruit, and with this demand the nurseries of Ontario have been able to do a large and flourishing business. There are in the neighbourhood of 59 nurseries located in the following districts:—Niagara Peninsula 26, Western Ontario 18, Eastern Ontario 12, Northern Ontario 3.

It may be seen from these figures that the greater number of the nurseries are located in the Niagara peninsula. This section is especially adapted in most localities for the production of nursery stock. In the neighbourhood of Fonthill there are six nurseries, two of which rank among the largest in Ontario. The balance are situated north of the height of land. Practically speaking, the Niagara Peninsula produces 85 per cent. of the nursery stock grown in the Province utilizing 1,145 acres for this industry.

There are 1,263 acres devoted to the growing of nursery stock. Of this area, three nurseries control 900 acres, leaving an acreage of 365 amongst the remaining 56 nurserymen. The business is practically then in the hands of these large firms.

A great quantity of nursery stock is imported into Ontario every year, and these imports are on the increase. The value of the stock imported through Windsor and Niagara Falls in 1904 was $12,724.50; In 1908, the amount imported through Niagara Falls alone was $21,497.00, showing an increase of $8,772.50 over the aggregate of the two points in 1904.

A great deal of this stock are seedlings for grafting and budding.

The total amount of nursery stock growing in Ontario is approximately as follows:—

Conifers, 557,000; deciduous ornamental trees, 534,500; apples, 1,924,500; pears, 215,450; cherries, 279,900; plums, 268,100; peaches, 409,100; grapes, 115,700; about 75 acres of small fruits and 50 acres of ornamental shrubs.

The fumigation houses are located on the nursery grounds and the nurserymen have to fumigate the stock before it can be sold. In the spring, every nurseryman is notified that the inspector will shortly visit his nursery and inspect his fumigation appliances. He is then supposed to examine it himself and test it making it as tight as possible. When the inspector visits the place, he examines the condition of the house and tests its tightness with smoke. This is done by building a smudge and closing the doors. If the house is tight no smoke will escape, but should it be leaky the smoke will indicate the leaks. These are marked, and the nurserymen told how

remedy them. Should the leaks not be mended before the inspector leaves, he returns to see if his instructions have been carried out. All the fumigators in the province have been examined this year as usual and found in very good shape. Slight alterations had to be made, but in every case the nurserymen willingly complied with our instructions.

One or two houses were condemned and new ones built. In the majority of houses the method of generating the gas is very simple. In every case possible I have instructed the nursery to put in such appliances as are used in the Dominion Fumigation House at Windsor, modifying them to suit conditions. The chief feature in this method is the convenient way of putting the cyanide into the diluted ulphuric acid. The plan adopted is to place a little tray which will hold the required dose imediately over the jar with the acid. To this tray is attached a lever or string which passes through the wall of the house. The doors are then firmly closed and the string pulled. This empties the cyanide into the acid starting the generation of gas.

The formula which is being used is potassium cyanide, 1 oz., sulphuric acid 1 oz., water 3 oz. to every 100 cu. ft. of space. The chemicals have to be purchased wherever the Department requires, although under special conditions they will allow the nurseries to purchase their chemicals at the nearest place. This precaution is taken to insure an even standard of chemicals used. The nurseryman sends the cubical contents to the firm directing them as to how many doses he will require. The packages are made up so as to contain the required amount of material for one dose. In this way the nurseryman has no weighing to do and runs very little chance of making mistakes.

The Dominion Government has two fumigation houses in Ontario situated at Windsor and Niagara Falls and all nursery stock coming from the United States into Canada through Ontario have to pass through these ports and are fumigated there. Through the courtesy of the Dominion Department of Agriculture, our Department inspector visits these places from time to time in order to satisfy himself that the stock being distributed in Ontario is properly treated. I visited these two houses several times and found that the work was being properly performed, and that the stock was being as quickly and carefully handled as possible.

WINNIPEG INDUSTRIAL EXHIBITION.

The exhibit made at the above show in 1908 was a decided improvement upon that of 1907, the first year Ontario was represented. Previous to this date for a number of years, British Columbia made annual exhibits of her fruit products. The main idea was to secure settlers for her vacant lands and in this she has been very successful. As the fruit lands became productive the further idea was evolved of opening up markets for the berries, cherries and apples raised thereon. The western people began to talk of the fine fruit grown in British Columbia while Ontario was losing what little prestige she had, and of course to the great majority of the newcomers was practically unknown. To overcome this state of affairs, and to push the sale of Ontario's fruit products, has been the object of our exhibits. At the same time if we can induce some of the men of the west who are giving up the growing of grain, to come east and settle in Ontario, we will be helping to make up for the terrible drain on our rural population from the east to the west.

Ontario's Principal Fruit Market in the West—Winnipeg.

The accompanying illustration will give an idea of the exhibits at Winnipeg. The fruit is shown in a building 50 feet long by 75 feet wide, finished in the natural wood inside. Only the two provinces were represented, the British Columbia Government exhibit taking up all of one end, while the Ontario exhibit occupied the centre and one half the other end. The land selling companies occupied the balance of the building.

The centre space was taken up by a pyramid 20 x 30 ft. the base holding a double row of boxed apples of the following varieties:—Spy, Ontario, Greening, McIntosh, King, Baldwin, Canada Red, Stark, Ben Davis, Golden Russet, Swayzie, and Tolman.

Above this were two shelves with bottled fruits, cherries, berries, plums and peaches, while on top were pyramids of apples. Between were two rows of fruit scenes, enlargements from photos of farms in various parts of the province.

Part of Ontario's Exhibit at Winnipeg, 1908.

The end space was in the form of a triangle with arms 22 and 38 feet long and 6 feet wide. Here were displayed 3 large pyramids of honey, buckwheat, clover and basswood in fancy glass jars, besides several dozen of comb honey in the case. Interspersed were packages of tomatoes, cucumbers and cherries with boughs of apples, peaches, cherries, plums, pears and various nuts in the green stage. The whole exhibit was surrounded by a railing and suitably decorated.

The exhibit was in my charge with Mr. J. W. Crow of the Agricultural College, Guelph as assistant. In addition to answering many questions in reference to fruit conditions in Ontario, we distributed copies of the pamphlet issued by the Colonization Branch on "Opportunities in Fruit Growing in Ontario" and the marketing circular issued by the Ontario

Fruit Growers' Association giving the names of the shipping associations, their secretaries and their probable output for 1908. We found a great deal of interest was shown in our exhibit and many inquiries in reference to the shipping of our softer fruits such as berries and sour cherries to the western markets.

To show the importance of these markets, I give below some statistics collected by Mr. Crow covering the seasons of 1907 and of 1908. The enormous growth of the west has been a matter of general comment and little need be said here further in reference to it. These people are large consumers of fruit. They cannot raise any themselves as is done by many of our Ontario people and are dependent on British Columbia, the north-west States or Ontario for these articles. The market is a valuable one and the fight for its control will be keen. This Branch feels justified therefore, in doing everything possible to encourage our Ontario growers in gaining a foothold there.

"Fruit received in Winnipeg in car lots from all points during 1907:—48 cars of strawberries; 430 cars of tomatoes; 680 cars of peaches, pears and small fruits other than strawberries; 600 cars of oranges, and upwards of 1,000 cars of apples. Large as these receipts may appear, you can judge that the receipts will be even double in a very few years, as the population of Winnipeg has grown from 67,000 in 1904 to 118,250 in 1908. Over seventy per cent. of these receipts was consumed locally."

The proportions of fruit received from different points and handled in Winnipeg are estimated by the McNaughton Fruit and Produce Exchange as follows:—

California, Oregon, and other northwestern States	50 per cent.
Ontario	35 per cent.
British Columbia	15 per cent.

Mr. A. Mallinson, who has this season bought very largely in Ontario for western firms, estimates the total quantities of fruit shipped to the West from Ontario this year as follows:—

83,500 barrels apples, including a few boxes, estimated at three boxes per barrel.
220 car-loads of grapes, estimating 2,400 six-quart baskets as one car-load.
73 car-loads of tomatoes, pears and canteloupes.
Included in the last item would in some cases be a few baskets of plums, and a few peaches went forward also.

Mr. A. Gifford states that fully 20 per cent. can be added to the above estimates of total shipments. Mr. A. Mallinson states further that shipments of fruit from Ontario to Winnipeg have increased fifty per cent. during the last five years, and fully one hundred per cent. in the last ten years.

From a communication received from Mr. A. McNeill, Chief of the Fruit Division, I quote the following, with reference to the apple trade of 1907:—

The North West Transportation Co. handled	100,253 bbls.
The C. P. R. handled	18,720 "
Other boats handled about	10,000 "
	128,973 "

The G. T. R. and American lines not known,—probably half the C. P. R.

ONTARIO HORTICULTURAL EXHIBITION.

The above Exhibition was managed for the first time from this office. In previous years, as secretary of the Ontario Fruit Growers and the Bee Keepers' Associations, I had acted as general secretary of the fruit and honey displays of the Exhibition. Last year Mr. Cowan who had previously acted as general secretary of the show moved to Peterboro, and I was elected as general secretary in his stead.

Part of Table Display of Apples at Horticultural Exhibition, Toronto, 1908.

The Exhibition was held this year in the St. Lawrence Arena. It was felt that Massey Hall where the show had previously been held was inadequate for the growing number of exhibits. The transfer proved to be a wise one in this respect as the exhibits of fruit, honey and vegetables were away ahead of any past show. The entries in the flower sections were somewhat behind previous years owing to the fact that the season was a poor one for the growth of plants under glass. Notwithstanding this difficulty, the floral men made a very creditable display and are to be congratulated on their exhibits of the various ornamental plants and flowers.

Very heavy expenditure was required to place the St. Lawrence Arena in shape for a show of this kind. At that season of the year when tender plants are shown, a certain amount of heat is required to prevent injury from frost. To this end it was necessary to place special heating apparatus in the Arena. A complete canopy of cotton was also required overhead and the necessary lighting to show off the fruit, flowers, etc., to advantage, cost in the neighbourhood of $675.00 for the one item alone. These heavy expenditures caused a deficit of about $300.00. This was met by paying only 85 per cent. of the prize money. The Association holds an asset for something over $300 in lumber, etc.

At this exhibition, the Fruit Experiment Stations have usually made a display of apples and other fruits in glass. Owing to lack of funds, it was thought unwise to put up as large a show as in past years. The stations at Walkerton, under Mr. Sherrington, Leamington, under Mr. Adams, and Craighurst, under Mr. Caston, furnished most of the material. In addition, Mr. McKenney, district representative in Essex, put up a display of apples from that county.

The display made by the Central Experimental Farm, Ottawa, under Mr. Macoun, was specially worthy of notice. The C. E. F. seedling apples and the various crosses obtained from their orchards attracted a great deal of attention. The showing of hardy varieties of grapes also proved what could be accomplished by the fruit growers in the eastern part of the Province. The illustrations shown give some idea of the various exhibits.

Among the counties making special exhibits, Norfolk certainly put up the best display. There is no doubt that Mr. Johnson and his assistants succeeded in giving this county the best advertisement as an apple growing section that it has ever received. It is the intention of this county to continue the exhibit at the next show, and there is no doubt that other counties will follow the splendid example set by Norfolk.

CANADIAN NATIONAL EXHIBITION.

At the request of the Directors of the Canadian National Exposition in Toronto, a special appropriation of $800 was made for the getting together of a display of fruit for this exhibition. The end of the main hall in the new agricultural building was allotted to this Province and it was divided equally between the displays of minerals and fruits. The fruit was shown on six large pyramids especially erected for this purpose. The illustration shows in the foreground one of these pyramids containing samples of peaches. Other pyramids contained plums, pears, apples, grapes, etc., together with small fruits and cherries under glass. Every thing was put up in attractive form.

As the show lasted for two full weeks, it was found necessary to replace the fruit every two or three days. The peaches specially required frequent

Part of Box and Barrel Exhibits at Horticultural Exhibition, Toronto, 1908.

changing, and we have to thank the growers in the Niagara district who took pains to send in shipments from day to day to keep up this display. We would specially mention Messrs. Carl Fisher & Sons, Queenston, W. C. McCalla, St. Catharines, J. W. Smith & Sons, Winona, H. Fleming, Grimsby, C. L. Parmeter, Grimsby.

Most of the plums were obtained from Mr. J. E. Henry, of Winona, who is the owner of one of the best plum orchards in the Niagara Peninsula.

In addition to that part of the exhibit already mentioned, one large table was given over to a special exhibit of package fruit illustrating the very latest methods of packing and shipping fruits to long distance markets. The various packs used with the standard apple box were shown, also those for pears, plums, peaches, etc. These goods were put up through the kindness of Mr. Robt. Thompson, the manager of the St. Catharines Cold Storage and Forwarding Association, who has always done everything possible to advance the cause of fruit growing in the Province. The Directors of the St. Catharines Cold Storage Association also deserves the thanks of the fruit growers for aiding Mr. Thompson in his work.

ROYAL HORTICULTURAL EXHIBITION.

Acting on instructions from the Honorable Mr. Monteith, a large collection of fruits and vegetables was gathered together for display at the Colonial Show of the Royal Horticultural Society in London, England. In 1907, a small collection was sent over from the Ontario Horticultural Exhibition, but reached London in poor condition. As a result of his visit to the Old Country, Mr. Monteith decided that it would be in the interests of the Province that a creditable showing be made this year.

The Royal Horticultural Society is one of the oldest and most prominent horticultural organizations in the world, and its shows are considered to be the best of the season in England. Sometime ago the society inaugurated a number of special exhibits for the display of fruits, vegetables, etc., grown in the colonies and dominions of the Empire. Of these, the most successful was the one held in the latter part of November in the Society's Hall, London, England. Ontario exhibited at this show for the first time five years ago, when she received a gold medal. The fruit was at that time contributed by the Provincial Fruit Growers' Association and forwarded through the kindness of Mr. A. McNeill, Chief Fruit Division, Ottawa. In 1907, the Fruit Growers' Association again contributed the fruit. In 1908, at it was necessary to secure much greater quantities, special packers were sent out from the Department to pack the apples, pears, etc. The whole was collected in cold storage at Toronto and forwarded to England on the 5th of November in charge of my assistant, Mr. Revett, and Mr. P. P. Farmer, of the Institutes Branch.

Mr. T. B. Revett, reports as follows on this exhibit:

In preparing the exhibits for the Colonial Show held by the Royal Horticultural Society at London, England, we aimed at having an exhibit that would show as much variety, and represent as many branches as possible connected with the horticultural interests of the Province. The displays consisted of fruit, vegetables, preserved fruit in glass, canned fruit and canned vegetables. In collecting the exhibits of fruit and vegetables, we endeavored to visit all the best fruit and vegetable growers in the Province in order to find where we could get the varieties and quantity required. To those that we did not have the opportunity to visit, we wrote requesting them to keep any of the varieties required, with instructions how to pack

Part of Ontario's Exhibit at Toronto Industrial Exhibition, 1908.

them, but whenever it was possible, we sent someone to do this work or attended to it ourselves. In every instance the growers gave us every assistance and co-operation in collecting and locating the produce, and in some instances even gave us samples they had intended to show at the different exhibitions.

Apples. We had a splendid collection of apples, consisting of 250 boxes, containing about 80 varieties, a list of which is as follows: Grimes, 2; Fallawater, 2; Greening, 3; Pearmain, 5; Wolfe River, 1; Gano, 1; American Pippin, 1; Pewaukee, 1; Cranberry, 2; York, 2; Minkler, 1; Ontario, 9; G. Russet, 10; Baldwin, 22; Spy, 27; Stark, 32; Scott's Winter, 4; Ben Davis, 20; Canada Red, 11; Tolman, 1; Western Red, 2; Scarlet Pippin, 8; Pomme Gris, 2; Blush Pippin, 1; Fameuse, 14; Phoenix, 8; Mann, 4; Blenheim, 2; Bellefleur, 8; MacIntosh, 8; Baldwin Stark, 1; Wagner Baldwin, 3; Seek, 3; Salome, 1; A.M. Pippin, 1; King, 13; Spitzenburg, 4; Vanderveer, 1; Wealthy, 3; miscellaneous varieties, 6.

The apples were collected at Oshawa, Bowmanville, Newcastle, Trenton, Stirling, Maitland, Ingersoll, Forest, Chatham, St. Catharines, and Fonthill. Mr. Morris, of the Fonthill nurseries, who has an experimental apple orchard of some 500 varieties, very kindly allowed us to make a collection of plate fruit from this orchard, and we were thus enabled to get some forty varieties which are not grown extensively but which added a great deal to the display of fruit.

The apples were carefully picked, graded and wrapped and packed in boxes, a cushion pad being used at bottom and top to prevent bruising. In the case of tender skinned varieties, such as those belonging to the Fameuse or Snow family, we took special precaution in wrapping, using two papers, first a soft manilla and an outside wrapper of parchment. In wrapping the other varieties we used three papers on different lots in order to test the difference. The papers were parchment, very thin manilla, and a coarse grade of manilla. The parchment and coarse manilla seemed the best. The parchment is the best of the latter two for long distance shipments, and exhibition purposes. As soon as the fruit was packed, it was shipped to Toronto Cold Storage, which was made the central point for collecting before final shipment.

Pears. The pears were secured chiefly in the Niagara district and at Burlington and Newcastle. They were double wrapped and packed in the large pear case, the fruit being shipped into cold storage at Toronto as soon as possible. We found in every case that the fruit packed somewhat green kept better. This brought out the fact that in long distance shipments and storages, enough attention has not been paid to the degree of ripeness. The following is a list of the varieties exhibited: Anjou, Bosc, Clairgeau, Flemish Beauty, Goodale, Hardy, Howell, Keiffer, Le Conte, Louise, Manning, Pitmaston, Seckel, Winter Nelis, Wilmot, Duchess, Sheldon.

The Duchess stands out as the most suitable variety for the English market. It arrived in beautiful condition and stood up for three weeks on exhibition tables. The flesh was very fine and juicy, the only drawback being the tendency of the skin to discolor even though the fruit be perfectly sound. The Keiffer and Le Conte were excellent and seemed to be selling well on the English market, but Le Conte although in perfect condition has a very poor flavor and the color is too pale.

The Bosc, Clairgeau, Howell, Goodale, were in about the same condition, but not so good as the Duchess and Keiffer, and did not last as long, the Bosc having slightly better quality, appearance and texture than the Clairgeau, Howell and Goodale.

Portion of Ontario Fruit Exhibit, awarded the Gold Medal at the Royal Horticultural Society's show, London, England.

The Seckel, Winter Nelis, Wilmot, Louise and Sheldon were good, the flavor and texture being excellent. Of these the Wilmot lasted the longest. This pear was originated at Newcastle by Mr. A. C. Beman, and showed excellent shipping qualities. It took on a very pale yellowish color, but was extremely uniform, of very firm texture and fair flavor. The Seckel, Winter Nelis, and Louise were in good condition. The Seckel, however, shrank a little and although perfectly sound and of a beautiful flavor was not attractive looking.

The Sheldon attracted perhaps more attetion than the other varieties. We had about twenty of these pears on plates. They were very sound, juicy, of fine flavor and appearance, which, together with their uniformity seemed to suggest that it would be an admirable variety for the first-class trade. The percentage of loss through decay was about 4 per cent. The Flemish Beauty, Hardy, Manning, and Pitmaston lasted during the exhibition, but had practically lost their flavor and were somewhat dull in color.

Plums. We took over about fifteen pounds of Reine Claude and Monarch plums. The Monarch started to go off before the exhibit left Toronto and were completely rotten when opened in London. The Reine Claude, however, were very much better, and we were able to get about three pounds of good fruit to show on plates.

Peaches. Six cases of peaches were shipped, two Elberta, two Smock, two Fitzgerald. The Elbertas were very large specimens, and all rotted except five, which did not last long and were completely discolored throughout.

The Smock were somewhat better, and were of a medium size, and in better condition, although we only could procure about ten perfect specimens.

Fitzgerald were very good, the color was good and the flavor was not completely lost and we showed about twenty good peaches.

The peaches were wrapped in parchment paper and padded with cotton batting and packed in the regular peach case.

Grapes. The grapes were put up in boxes 22 x 12 x 12 and packed in cork dust. These boxes held about twenty pounds. The cork dust was procured from dealers in Malaga grapes. This dust was in some cases very dirty, containing a lot of dry grapes and foreign matter, so it required cleaning by being seived. After being cleaned it was treated with a ten per cent. solution of formalin as a preventive to mildew and moulds. A layer of cork about 1½ inches thick was placed in the bottom, a layer of grapes and another layer of cork until the case was full, the case being shaken from time to time in order to settle and tighten the pack.

In case of three packages, the bunches were wrapped individually in parchment paper. This kept the cork dust from getting into the bunches. The plan worked admirably. The following is the list of varieties shown and their condition: Agawam, very good; Brighton, good; Catawba, good; Campbell's, not good, berries fell off bunch; Delaware, very good; Lindley, good; Moyer, very good; Niagara, fair; Vergennes, good; Worden, good;

In a good many cases it was found that while the grapes were quite sound, yet the formalin which was used to disinfect the cork dust seemed to have had a bleaching effect on the color and the grapes in many instances had faded considerably. This was perhaps due to the fact that the dust was treated immediately before being used, while it should no doubt be exposed to the air for at least twelve hours after treating.

Vegetables. The vegetables were all collected in the vicinity of Toronto with the exception of corn, pumpkins and potatoes. Corn was procured from Leamington and potatoes from Parry Sound. There was a full col-

lection of vegetables and in every case the leading varieties were represented as will be seen from the list. These vegetables were sent to cold storage, where they were carefully packed in boxes made for the purpose. The potatoes, turnips, winter radish, horse radish, parsnips, carrots, salsify, artichoke, and corn were wrapped in a coarse manilla paper and packed in boxes. In the bottom and on top we used excelsior in order to tighten the boxes and prevent bruising.

All the rest of the vegetables were shipped in slatted crates. The cabbage and cauliflower were packed in long crates. In packing, the crates were lined with coarse paper and padding of excelsior, each head of cabbage being wrapped in parchment paper and placed carefully and lightly in crate. The cauliflower were treated the same way, except that additional precaution was taken to protect the head by wrapping this in parchment also.

The Kale and Brussels sprouts were also shipped in long crates, each specimen being wrapped in thick paper and carefully packed.

The celery was packed in cases 18 inches by 24 and 24 inches high. The bottoms were made of board and the first slat was 6 inches broad. This was

Portion of Ontario Fruit Exhibit at London, England.

done in order to protect the roots and to keep the sphagnum from falling out. Each bunch was wrapped in paper as far down as the roots. Then they were carefully laid on end with moist sphagnum around the roots. This was done to keep the celery fresh. The following is a list of vegetables shown: Artichokes, Borecale, Curly Kale, Brussels sprouts, Cabbage, red; Cabbage, Savoy; Cabbage, flat; Cauliflower, Erfurt; Cauliflower, Snowball; Celery, White Plume; Celery, Paris Golden; Celery, red; Carrots, ox heart; Carrots; Cucumber; Citrons; Egg Plants; Onions, White Globe, Yellow Danvers, Red Wethersfield, Red Globe, Prizetaker, Rocca, White pickling. Parsnip; Peppers, a collection of about twenty varieties; Radish, winter; Salsify; Squash; Potatoes, Delaware, Crown Jewel, Late Rose, Beauty Hebron, Rural New Yorker, Ontario Beauty; Turnip, white; Turnip, Swede; Vegetable Marrow; Horseradish.

Canned Fruit and Vegetables. The canned fruit and vegetables and preserved fruits were collected from some of our large canning and preserving factories. This exhibit consisted of a complete collection of all our

fruits and vegetables. There were 100 cases of vegetables consisting of tomatoes, corn, peas, corn on cob, beans, asparagus, beets, pumpkin.

There were fifty cases of all kinds of canned fruits, preserved fruits in glass, jams and jellies in glass, etc.

The whole exhibit was collected at the Toronto Cold Storage and was shipped from there in an iced refrigerator car, to Montreal on the 5th November. This car arrived in Montreal on the 7th and the contents were placed in the refrigerating chamber on the Dominion Line S. S. Kensington on the 8th. The cases were packed firmly, five high and with dunnage between every layer to allow for circulation. The Dominion Department of Agriculture through the courtesy and instructions of Mr. J. A. Ruddick, caused a thermograph to be placed in the centre of our exhibit which would enable us to have a correct idea of the temperature maintained throughout the voyage.

The Kensington sailed on the 9th of November and arrived at Liverpool on the nineteenth, and as soon as the ship docked, the exhibit was unloaded and sample cases examined. It was found that peaches, plums and tomatoes were rapidly decaying and that the cabbage and cauliflower showed a slight discoloring of the leaves. The thermograph showed that atmospheric temperature was quite cool, being about 38 deg. F., and the average temperature maintained throughout the voyage was 36.5 deg. F., from Liverpool, the exhibit was shipped to cold storage in London until the opening of the show on November 27th.

The Exhibition was held in the Royal Society's own hall, which was crowded with exhibits from the various provinces and colonies of the Empire. The Department had cabled for enough space for the entire exhibit, but we were 200 feet short of the space required. The position and general outline of the exhibit is shown in the illustration.

The time allowed for placing of a large exhibit is too short as we were only allowed from 7 o'clock p.m. of the evening preceding the opening of the exhibition.

The fruit was found to be in splendid condition, while the vegetables were just as good as when packed with the exception of the cabbage and cauliflower, the leaves of which were frost bitten. In the case of the cauliflower all the leaves fell off, but the heads were in splendid shape, not the slightest degree discolored, nor did they discolor for at least six days after exposed. It seems almost impossible to trace definitely when and where these vegetables were frozen, but it seems probable that they might have been slightly touched with frost in the field or in transit to Montreal.

For the entire exhibit Ontario was awarded a gold medal, while the Provinces of Nova Scotia and British Columbia also received one each, and a number of individual growers who had shown under the auspices of the Provinces were also awarded other medals. As an explanation of this the secretary of the society explained that any exhibitor who had received a gold medal could not receive any further recognition for any other of his exhibits. He explained that this show was not competitive and that all the exhibits were judged by their standard of excellence. The displays which were put up by the Provinces of Nova Scotia and British Columbia were practically and wholly made up of these individual exhibits and the Governments were awarded a gold medal for their trouble in transporting and displaying the exhibits. Had our entries been made along the same lines, mentioning the names of the associations and individuals supplying the fruit, Ontario would have received the same treatment.

Our exhibits were in splendid condition. The fruit especially showed no bruises and looked very fresh, being as good, and in many cases better than that in the other exhibits. Ontario had a greater collection of varieties, and was the only exhibitor to show fresh vegetables, preserved and canned fruits and vegetables.

After this exhibition was over, the exhibit was divided into two parts, Mr. Farmer took one portion and made three displays, one at Norwich, and two at Ipswich. One of these was held at the Cattle Show and the other at the Butter Market in an office that was hired for the purpose. I took the other portion and made two displays, one at Bristol and another at Exeter. These were all under the supervision and with the assistance of Ontario Colonization Branch for the purpose of advertising the Province and giving

Ontario Fruit Exhibit at Ipswich, England.

the people in those sections of the country an idea of what the Province of Ontario can produce.

These shows were very successful, thousands of people visiting them. Many were greatly surprised at the size and quality of our vegetables. This was about the first occasion that any of our fruits or vegetables have ever been shown in England as distinct products of Ontario, while the Provinces of British Columbia and Nova Scotia have been exhibiting in various parts of the British Isles for some years. Such an advertisement is not only valuable in attracting the attention of the most desirable class of people who wish to emigrate but also assists our fruit growers who engage in the export business by bringing to the notice of the best class of both wholesale and retail buyers the kinds of fruit which we are capable of producing.

After studying all the conditions in the old country, I would suggest that in future we brand all our fruit packages with the word "Ontario" in large type. At the present time, our fruit is designated as Canadian while British Columbia and Nova Scotia fruit receive their distinctive titles.

In closing this report I wish to state that wherever Mr. Farmer and myself went we were given every assistance possible by the people with whom we came in contact.

FRANCO BRITISH EXPOSITION.

At the request of the Colonization Branch of the Department of Agriculture a collection of apples was made for the above show, which opened

Part of Ontario's Exhibit at Ipswich, England.

in Sheppard's Bush, London, England early in May. Advantage was taken of the offer made by the Grand Trunk Railway System to make use of the centre of their building for our Exhibit. A large pyramidal case was specially constructed to hold plates and cones of fresh fruit under glass on shelves above, with samples of our other fruits modelled in wax in cases below.

A complete collection of our standard winter varieties of apples, comprising one hundred and fifty cases, was shipped by Dominion Express, from cold storage in Toronto, late in April via St. John. The shipment was in cold storage the entire journey, except from Liverpool to London, and was of course again placed in cold storage on arrival at its destination. I gave the handling personal supervision, until the cases were safely deposited in

the storage chamber of the ship at St. John, N.B., and this combined with careful treatment on the other side enabled the Grand Trunk officials to preserve intact the exhibit of fresh fruit until the close of the show in October. Some of these apples were of the same lot that suffered so badly in transit to the Royal Horticultural Society Exhibit of the previous November. The difference in treatment en route represented a difference in keeping quality of almost a year.

CO-OPERATIVE ASSOCIATIONS.

For the guidance of prospective berry shipping Associations there is given herewith in full the constitution and by-laws of the Neosho Fruit Growers and Shippers Association, a prominent strawberry shipping company in Tennessee; also some of the leading clauses in that of the Knox County Berry and Truck Growers' Association of the same state.

Ontario's Fruit Exhibit at Franco-British Exposition, London, England.

CONSTITUTION AND BY-LAWS OF THE NEOSHO FRUIT GROWERS' AND SHIPPERS' ASSOCIATION.

Preamble.

For the purpose of co-operating in the marketing of fruits and vegetables, and in providing packages for same, we, whose names are hereto annexed, adopt the following constitution and by-laws:

Constitution.

1. The organization shall be known as the Neosho Fruit Growers' and Shippers' Association.

2. The officers of this association shall be president, vice-president, recording secretary, treasurer, business manager, and a business committee consisting of five members, including the business manager, all of said officers to be elected by ballot in July of each year. The Business Committee to be elected first. A majority of all ballots cast shall be necessary to elect. No member of this Association shall hold more than

one office in the Association at one time, except the Business Manager, who is also required to be member of the Business Committee. An habitual frequenter of a saloon or a gambler is not eligible as a member of the Business Committee.

3. This Association shall meet on the second Saturday of each month at the Court House in Neosho, at 2 o'clock p.m., unless adjourned to meet elsewhere.

4. Any person who is a horticulturist or agriculturist may make application for membership (in writing) and must be recommended by two members of the Association. The membership fee of one dollar, and the annual dues of one dollar, must accompany the application and be offered at a regular meeting by some members of the Association. The application will then be referred to a committee of three members and laid over to next regular meeting, when if report of committee is favorable it shall be balloted upon. An applicant to be elected must receive two-thirds of all votes cast. Applications for membership must be filed not later than the March meeting in order to enable the applicant to ship with the Association the current year.

5. When growers in this Association ship berries as a firm or company, each individual member of the firm or company must become a member of the Association. No firm or company will be allowed to vote by proxy on any proposition before the Association.

6. The annual dues of this Association shall be one dollar, payable July 1st each year.

7. A quorum shall consist of seven members to do business.

8. In case of a vacancy in office the vacancy shall be filled at the first regular meeting or in case of emergency at a called meeting.

9. This Constitution may be amended at any regular meeting by a three-fourths vote of the members present, provided the proposed amendment shall have been written and in the hands of the secretary and read by him at two regular meetings previously.

By-laws.

1. All officers of this Association shall assume the duties of their respective offices at the August meeting and perform the duties required of them by the rules of the Association. The President shall call special meetings when requested to do so by the Business Committee or on petition of five members of the Association.

2. The Vice-President shall, in the absence of the President, perform the duties of the President. In the absence of both President and Vice-President, a temporary chairman may be elected by the Association.

3. The Recording Secretary shall keep an accurate minute or record of all the papers and records of the Association except his own bond. He shall collect all moneys due the Association for dues, fees, fines and forfeitures. He shall pay over all moneys coming into his hands to the Treasurer every month, taking the Treasurer's receipt therefor, and file said receipt with the auditing committee as soon as they are appointed. He shall give a bond of four hundred dollars, signed by two good securities. Said bond shall be kept by the President. He shall receive twenty-five dollars per year for his services.

4. The Treasurer shall receive all moneys belonging to the Association from the hands of the Recording Secretary, giving his receipt therefor; render a true account of all moneys received and paid out and to whom paid. He will pay out money on warrants ordered by the Association and signed by the President and Secretary. He shall give a bond of one thousand dollars signed by two or more good securities, and he shall receive twenty-five dollars per year for his services.

5. The Business Manager shall act as Secretary and Treasurer of the Business Committee. He shall keep a full and correct record of all transactions of the Committee and attend to all the correspondence of the Association. He shall receive all the returns from the commission merchants and other sources, and make disposition of same as quickly as possible as directed by No. 14 of the By-laws. When elected he shall execute a satisfactory bond in the sum of $25,000 to the Association as individual members, for the faithful performance of the duties required of him as Secretary and Treasurer. He shall receive for his services one per cent. of the gross sales of all berries shipped. He shall employ a bookkeeper and all other help needed at the shipping sheds at salaries which, in his judgment, are economical to the Association, and at the same time just to the one employed. The salary of the Manager, and other help, shall be paid out of a fund created for this purpose. He shall have full control of the shipping sheds. He shall present his books and accounts to the auditing committee when said committee is appointed to examine the accounts of this Association as provided by No. 18 of the By-laws.

5. (Sec. 1). TheBusiness Committee as soon as they shall have been elected, shall organize by electing one of their number chairman. They shall meet at the call of their chairman. They shall have power over the actions of the Business Manager as a

whole, and in case of sickness, death or any other disability of the Manager during the shipping season, shall select a temporary manager. The chairman and each member of the committee, excepting the Business Manager, shall receive two dollars each meeting of the committee, for members in attendance. It shall be the duty of the Business Committee to select the commission merchants who shall handle the berries of the Association.

5. (Sec. 2). For the purpose of paying the Business Manager, bookkeeper and all other help and expenses incurred in the shipment of berries, there shall be set aside two per cent. of the gross sales of all shipments. After all salaries and expenses have been paid, the remainder of this fund to be pro-rated to the growers as other receipts. All of the bonds given by members of this Association shall be approved by the Association.

6. Each officer, committee, agent, or any other members shall present to the Association an itemized account of any expense to which he may have been, that a warrant may be issued in his favor on the Treasurer.

7. Nothing shall be so construed as to hold any member responsible for the provisions of the Constitution or By-laws, who shall voluntarily withdraw from the Association or quit the business of fruit growing.

8. Any member withdrawing from the Association shall be entitled to receive his dividend of the unexpended rebate, but shall forfeit to the Association all other money belonging thereto.

9. A voter in this organization shall be a member who is a grower of berries. No members shall have more than one vote on any subject.

10. All members of this Association must buy all of their crate material through the Association.

11. All members obligate themselves to turn over all berries to the Business Committee, to be shipped by them, except those they may need to supply home demand, or for shipment to friends. In no case shall any member be allowed to sell berries for shipment, unless he obtains consent of the Business Committee to do so. Upon complaint of any one that a member violates the above obligation, the Business Committee shall make an investigation at once, and if found guilty, the Secretary shall be notified to drop his name from the membership list. It is of great importance that the growers deliver all fruit to the management, that commission houses arranged with may not at any time be disappointed by not receiving expected shipments. Each grower must deliver or be in line ready to deliver at the shipping sheds all berries he has to ship each day not later than ten (10) o'clock p.m.

12. The grades of strawberries will be two, designated as "A" and "B" (the "B" grades blank). The "A" grade must be strictly choice, firm sound stock, of good size. The "B" grade must also be firm and sound, but may be somewhat smaller. Where the difference in selling price is not noted on account sales of receivers, the Secretary shall make division on a basis of a difference of 25 cents per crate between the two grades. Fruit that is too soft or otherwise unfit to grade "B" will be rejected. After inspection at shipping sheds berries that grade "A" will have the crates stamped on both ends with the Association's trade mark, which shall read as follows, viz: "The Original Neosho Strawberry. Grown by the Neosho Fruit Growers' and Shippers' Association."

13. It shall be the duty of the Business Committee to employ a man of good judgment and ability to inspect all fruit delivered by growers for shipment, and he shall be given as many assistants as are necessary; and he shall have power to change grades and reject any and all fruit which in his judgment, and the judgment of the Business Committee, is unfit for shipment.

14. Each grower shall receive the average price per crate of each grade each day. Should it be necessary to hold over berries from one day to the following day for shipment, then the number carried over shall be disbursed with that day's shipment. A clean-up shall appear as having been made each day.

15. The Secretary receiving berries must give each grower a receipt for the number of crates of berries deliverd, designating the number of crates of each grade.

16. All members obligate themselves to be governed by the decision of the Association in regard to the prices to be paid for picking berries, and they agree that they will not in any manner, directly or indirectly, such as by a gift, premium, or by counting more trays or quarts than has actually been received at the packing sheds, or through any member of the family, or any other individual, pay more than the price agreed upon by the Association. The penalty for violation of this obligation shall be the withholding of thirty-five cents a crate for all berries received in violation of the above named By-law. All complaints shall be filed with the field inspectors who shall investigate the matter and immediately report to the Business Committee, who shall act upon the matter promptly, and the funds accruing from fines shall be turned into the general treasury. A copy of this penalty clause shall be incorporated into the rules for the packing sheds.

17. The Business Committee shall have power to appoint a man as marshal if necessary, whose duty it shall be to see that each member shall be allowed to unload his berries in the order in which he may come to the unloading place. He shall see that no one drives out of his regular turn. Any dispute between growers shall be settled by the marshal. Any grower who shall refuse to abide by the decision of the marshal shall forfeit his place and go back behind every wagon present.

18. The President shall, at the regular meeting in June of each year, appoint the Auditing Committee, consisting of two members, whose duty it shall be to examine the books and accounts of the officers of the Association and Business Committee and report in writing at the regular meeting held in July following. The Auditing Committee shall each receive two dollars per day as compensation for the time required to examine the books and accounts submitted to them.

19. On any motion the vote shall be yea or nay unless some members shall request the vote being taken by ballot; and upon such request being made, the President shall appoint two tellers to take the ballots, and when the voting is by ballot every member present shall vote unless he is excused by the President, provided he is entitled to a vote. Any voter refusing to vote, who has not been excused by the President, shall forfeit to the Association fifty cents. A voter shall be a grower of berries.

20. Any member who shall be in arrears for dues three months shall forfeit his or her vote and all benefits of the Association and when six months in arrears shall stand suspended from the Association.

21. Any member who shall have been proved guilty of fraud or immoral conduct, or failed to meet his just obligations, or of any other act so as to affect the credit and good standing of the Association shall be barred from membership.

22. All members must acquaint themselves with the Constitution and By-laws and annex their names thereto.

23. These By-laws may be amended in accordance with Article 9 of the Constitution.

Knox County Berry and Truck Growers' Association.

Article II.

The objects of this Association are to encourage the better cultivation and increased acreage of strawberries, melons and other fruits and vegetables suited to this district. To secure better shipping facilities, find other markets for the above mentioned products when the local market is unable to handle the same at remunerative prices to the grower; also to secure prices on fertilizers and packages and to purchase same for Association. To secure rates and routes for transportation and anything necessary to the successful raising and disposal of any product which members of the Association may have.

Article VI.

Section 3. The Governing Board shall require anyone handling Association funds or moneys received from the sale of products belonging to members of the Association to give a satisfactory bond.

Section 4. The Governing Board shall appoint an Auditing Committee, who shall examine the Treasurer's accounts and report at the monthly meetings of the Association.

Section 8. The Governing Board shall furnish printed instructions to members about growing, packing, shipping, etc., the various products for foreign markets.

Article IX.

For the purpose of providing a fund for salaries and operating expenses (not including shipping charges and commissions), a charge shall be made which shall in no case exceed 7½ cents per package for crates, hampers and bags, or $12 per car for bulk goods, such as watermelons, cabbage, etc. After all salaries and expenses have been paid the remainder of this fund, if any, shall become the property of this Association.

Article X.

Section 1. All members obligate themselves to turn over their pledged products to the Governing Board to be shipped by them. Upon complaint of any member that a member violates the above obligation the Board shall investigate at once and if found wilfully guilty the Secretary shall be notified to drop his name from the membership list.

Section 2. Any member who shall have been proved to the satisfaction of the Board guilty of any act liable to affect the credit, good standing or in any way work against the interests or welfare of the Association may upon due notice be dropped from the roll and barred from membership.

A simple set of by-laws suitable for any apple shipping association is given herewith. Changes may easily be made to suit local conditions, etc.

By-laws of the Fruit Growers' Association, incorporated under The Ontario Companies Act.

1. This Association of fruit growers shall be known as the Fruit Growers' Association.

2. The objects of the Association are for the packing and selling of the fruit grown by its members, the purchase of supplies, packages, spraying materials, machinery, etc., also buying and selling such other fruit during the season as opportunity presents itself.

3. The annual meeting of the Association shall be held on the first Thursday in May in each year.

4. Special meetings may be held at any time upon call of the President by written notice mailed to each member five days before the meeting. Special meetings shall also be called by the President whenever required to do so in writing by any ten members.

5. At any meeting of the Association ten members shall constitute a quorum for the transaction of business.

6. At the annual meeting five Directors shall be elected, of whom three shall constitute a quorum at any Board meeting.

7. The officers shall consist of a President, Vice-President, Secretary-Treasurer, Manager and two Auditors.

8. The President and Vice-president shall be chosen by the Directors from among themselves at the first Board meeting after the annual meeting. The other officers shall also be chosen at this time, but not necessarily from among the Directors.

9. All elections shall be by ballot, plurality electing, conducted by two scrutineers appointed by the chairman.

10. The President shall preside at all meetings. He shall call meetings of the Board of Directors and members when necessary and shall advise with and render such assistance to the Manager as may be in his power. In his absence, the Vice-President shall have and exercise all rights and powers of the President.

11. The Secretary-Treasurer shall keep a record of the proceedings of all meetings and of all the receipts and disbursements, and report the condition of the finances annually or as often as the Directors shall desire.

12. The Manager shall have charge of the business in detail under the supervision of the President.

13. The Manager and the Secretary-Treasurer shall give bonds in such sums as shall be acceptable to the Association.

14. The Directors may select three of their number to act as an Executive Committee (the President to serve as chairman) to have general charge of the affairs of the corporation during the fruit season.

15. When a vacancy shall occur through any cause in any of the offices established by the By-laws of the Association, it shall be filled at the next regular or special meeting.

16. The annual dues of this Association shall be one dollar, payable on or before the date of the annual meeting.

17. Any fruit grower in county shall be eligible to become a member by a two-thirds vote of the members at the time application is made.

18. Any member may withdraw at any time between January 1st and April 1st. Notice of such withdrawal must be given in writing to the President or Secretary of the Association.

19. All apples grown by the members shall be delivered to the Association's packing house in prime condition for grading, packing and shipping. Other fruits may be delivered for sale on commission.

20. The books of the Association shall be audited before the date of the annual meeting each year. At this meeting a printed statement of the receipts and expenditures as audited shall be presented to each member.

21. These By-laws may be amended at any regular or special meeting by a vote of the members present in the affirmative. Notice of such amendments must be given each member by letter or otherwise at least five days previous to the meeting.

Some of our Associations may desire to make individual contracts with the members for the disposal of their fruit. A form in use by the Hood River (Oregon) Apple Growers Union is given below.

CONTRACT.

In consideration of the terms of this agreement, made and entered into this day of , 190 , I, hereby bargain and sell to the Hood River Apple Growers' Union my entire crop of merchantable apples of every grade and every variety for the year 190 , the said terms being as follows: All fruit shall be graded and packed under supervision of the Hood River Apple Growers' Union at the expense of the grower, and delivered by him at the ware house of said Union in the City of Hood River, Oregon, at such time as may be designated by said purchaser who shall give notice to the grower for such delivery. In further consideration of this agreement the said Hood River Apple Growers' Union has this day paid said the sum of $, the receipt whereof is hereby acknowledged. And in further consideration of this contract, said Hood River Apple Growers' Union agrees to pay the balance of the market price obtained by it (less a box for handling) to the grower within days after the delivery of fruit as aforesaid.

In witness whereof we have hereunto set our hands in duplicate this day of , 190 .

HOOD RIVER APPLE GROWERS' UNION,

By , *President.*

By , *Secretary.*

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Witnesses.

INSTRUCTION IN PACKING.

At the request of the Co-operative Fruit Shipping Associations a special instructor and inspector Mr. Jos. Backus of St. Catharines was appointed to visit these associations during the fruit packing season to give information and advice on the proper grading and barreling of fruit. There are some 35 associations in existence at the present time as follows:

	Manager or Secretary.
Ingersoll Fruit Growers' Association	J. C. Harris, Ingersoll.
Burgessville Fruit Growers and Forwarding Co	Arthur Frain, Burgessville.
Burlington F. G. A	W. F. W. Fisher, Burlington.
Georgetown Co-operative Association	F. J. Barber, Georgetown.
Georgian Bay F. G. A	J. G. Mitchell, Thornbury.
Owen Sound Fruit Co. Ltd	Adam Brown, Owen Sound.
Brant Packing Association	F. M. Lewis, Burford.
Bruce F. G. A	M. G. Dippel, Walkerton.
Forest F. G. A	A. Lawrie, Forest.
Canadian Apple Exporters, Ltd	W. H. Dempsey, Trenton.
St. Catharines Cold Storage and Forwarding Co., Ltd	Robert Thompson, St. Catharines.
Oakville Fruit Growers' Ltd	Thos Garner, Palermo.
Newcastle Fruit Growers' Ltd	W. H. Gibson, Newcastle.
Chatham F. G. A	W. D. A. Ross, Chatham.
Belleville F. G. A	F. S. Wallbridge, Belleville.
Ilderton F. G. A	E. T. Caverhill, Ivan.
Grimsby Co-operative Fruit Growers	The Manager, Grimsby.
Arkona F. G. A	T. A. Lampman, Arkona.
Norfolk F. G. A	Jas. E. Johnson, Simcoe.
Oshawa F. G. A	Elmer Lick, Oshawa.
Paisley F. G. A	A. L. MacKinnon, Paisley.
Orono F. G. A	E. J. Hamm, Orono.
Arran and Amabel F. G. A	J. Davidson, Skipness.
Jordan F. G. A	J. A Wills, Jordan.

	Manager or Secretary.
Watford F. G. A.	D. G. Parker, Watford.
Erie Fruit Co.	W. W. Hilborn, Leamington.
Thedford F. G. A.	Wm. Tudor, Thedford.
Hatchley Station F. G. A.	W. F. Robinson, Hatchley Station.
Cobourg F. G. A.	S. W. Staples, Baltimore.
Mt. Nemo F. G. A.	R. M. Spence, Nelson.
Grafton F. G. A.	J. G. Wait, Wicklow.
Dunnville F. G. A.	S. S. Smith, Dunnville.
Sparta F. G. A.	J. A. Webster, Sparta.
Norwich Gore F. G. A.	B. J. Palmer, New Durham.
Clarkson F. G. A.	W. G. Horne, Clarkson.
Alvinston F. G. A.	E. F. Augustine, Aughrim.
Arkwright F. G. A.	A. Gammie, Burgoyne.

Owing to the shortness of the season and the number of the associations wishing for his services, Mr. Backus was unable to give the time to the packers in each association that he would liked to have done. It would seem necessary another year to appoint at least two men for this work. The managers of the associations report very favorably at the close of the season on the instruction which they had received, stating that a more uniform pack was obtained than would ordinarily have been the case. There is no doubt that every head packer has his own ideas as to what constitutes a No. 1 and 2 apple. As these men do not come in contact with one another there is no other way of unifying the grades. Mr. Backus reports as follows in reference to his work.

In submitting my report to you there are a few things I would like to bring to your notice. The first is that there is really too much ground to be covered by one man to give any kind of satisfaction to the packers or instructors. About all a man could do was to pay a flying visit to each. All that I could do was to see the pack they were putting up at the time and could not get a good idea of the pack in general.

Outside Buyers. This is really one of the worst drawbacks that the Associations have, especially the weaker ones. These men try by every means to break up the membership. There is one way to get around this and that is through the use of the central packing house where it is at all possible. Too much cannot be said in its favor and as a general thing you find the best packing done there. The pack is then under the personal supervision of one competent man. In packing in the orchard it is necessarw for two or three gangs to work, hence two or three different packs, and not the uniform pack that the Associations are aiming at. In the central packing house you can employ women who do just as much work for less money and do not idle away their time.

The Packer. To be a successful packer a man must use some judgment as to what he is going to do with a lot of apples when he sees them and not wait until he has half of them packed to find out that his No. 1. grade are not up to standard so spoiling No. 2. It were far better if he had packed all No. 2 in the first place and have one good grade instead of two inferior ones. There was one case of a head packer who claimed to have had thirty years' experience and knew the game from A to Z and who did not believe in some of the new fangled ways. If I had been a Dominion Inspector at the time I think that he would have stopped and considered some of those new fangled ways. I referred him to the Fruit Marks Act, but I doubt if it did any good. Out of four specimens taken as a sample from a barrel of No. 1 apples, two were an inch in diameter and the other two about four inches. I found a case also of overpressing. The packer would hardly believe me when I told him. He was not tailing at all, so that some of the apples were in a very broken condition.

Well tilled apple orchard, owned by W. H. Gibson, Secretary Newcastle F. G. A.

Branding. This is one of the best ads that an Association can have and some of the managers are very particular about it (especially Simcoe, Oshawa, Forest, Georgetown and Owen Sound), as it is a very important item in the make up of a package. In one case the identity of the Association was lost altogether, due to the lack of a distinctive brand.

Proper Management Of The Orchards. This, I find, is the whole secret of success. Those Associations who follow out faithfully the three principles in apple growing, namely, spraying, pruning and cultivation, are the ones who are packing the highest percentage of No. 1 apples. A few men still say that spraying is of no use. Well, let them think it, but from what I saw last fall I would advise the ones that are doing these things to keep them up.

Pack Of Fruit. In travelling from place to place I always tried to see the work of the local packers, and am pleased to say that all of the Association packers, with the exception of two cases, were a little better than the average, and in some cases were much superior.

INCORPORATION FOR CO-OPERATIVE ASSOCIATIONS.

At the Short Course in fruit growing at the Ontario Agricultural College, Guelph, Mr. Mulvey, Assistant Provincial Secretary, outlined the requirements of the Ontario Companies' Act as applied to fruit shipping associations. He stated that the Act was very broad in the powers conferred upon associations incorporating under its provisions, and that a special rate of fees for each incorporation had been provided. These were as follows: Initial fee for taking out charter, etc., $10.00; annual fee thereafter in making returns $1.00. There were practically no restrictions as to the by-laws etc of such associations but he suggested various points which might be incorporated in the article of agreement which has to be submitted to his Department in applying for a charter. Copies of the forms required are submitted herewith. These differ in cases of companies taking out capital stock from those where no stock is required. The clauses of the agreement may be arranged to suit the requirements of different associations, and only the important bylaws need be included in the draft submitted in asking for a charter. Subsequent changes may be made without reference to the Department. Copies of these forms can be procured on application to this branch. All applications for incorporation, annual fees and returns, etc., must be sent to the Provincial Secretary's Department, Parliament Buildings, Toronto.

(For Associations Without Capital.)

Petition.

To His Honour J. M. Gibson, K.C.,
Lieutenant-Governor of the Province of Ontario.

The petition of .....
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.....humbly sheweth as follows:

1. Your petitioners are desirous of obtaining by Letters Patent under the Great Seal a charter under the provisions of The Ontario Companies' Act, constituting your

Dwarf pear orchard, owned by W. F. W. Fisher, Burlington F. G. A.

petitioners and such others as may become members of the corporation thereby created, a body corporate and politic without share capital under the name of , or such other name as shall appear to your Honour to be proper in the premises.

2. Your petitioners have satisfied themselves and are assured that the corporate name under which incorporation is sought is not on any public ground objectionable, and that it is not that of any known association, incorporated or unincorporated or of any partnership or individual, or any name under which any known business is being carried on, or so nearly resembling the same as to deceive.

3. Your petitioners have satisfied themselves and are assured that no public or private interest will be prejudicially affected by the incorporation of your petitioners as aforesaid.

4. Your petitioners are of the full age of twenty-one years.

5. The object for which incorporation as aforesaid is sought by your petitioners is: (*a*) To carry on a co-operative association for the handling, marketing and otherwise disposing of fruit, vegetables, cereals and all other produce of the farm; (*b*) For the purchase and distribution of machinery, implements, utensils and all articles used on the farm; (*c*) For providing cold storage, refrigerator warehouses, wharves and all means of handling and dealing with farm produce, and for packing, preserving, manufacturing or otherwise dealing with farm produce.

6. .....

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are to be the Provisional Directors of the Corporation.

7. Your petitioners have subscribed to a memorandum of agreement in duplicate, setting out the purposes and objects of incorporation and provisions for administering the affairs of the corporation.

Your petitioners, therefore pray that Your Honour may be pleased by Letters Patent under the Great Seal to grant a charter to your petitioners and such others as have or may become subscribers to the memorandum of agreement of the Corporation thereby created, a body corporate and politic for the due carrying out of the undertaking aforesaid.

And your petitioners as in duty bound will ever pray

Signatures of Witnesses. ..... Signatures of Petitioners.

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Dated at ..... this ..... day of ....., 19...

(*For Associations Without Share Capital.*)

Memorandum of the agreement of the Association, made and entered into this day of .

1. We the undersigned do hereby severally covenant and agree each with the other to become incorporated under the provisions of The Ontario Companies' Act as a corporation without share capital for the purposes and objects following:

(*a*) To carry on a co-operative association for handling, marketing and otherwise disposing of fruit, vegetables, cereals, and all products of the farm;

(*b*) For the purchase and distribution of machinery, implements, untensils and all articles used on the farm;

(*c*) For providing cold storage, refrigerator warehouses, wharves and all means of handling and dealing with farm produce, and for packing, preserving, manufacturing and otherwise dealing with farm produce.

2. The subscribers to the agreement shall be the first members, and it shall be determined by by-law the terms and conditions on which subsequent members shall from time to time be admitted.

3. The following shall be the first Directors of the Corporation: .....

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4. The first general meeting shall be held at such time not being more than two months after the incorporation of the Corporation, and at such place as the Directors may determine.

5. Subsequent general meetings shall be held at such time and place as may be prescribed by by-law of the Association.

6. Special meetings of the members may be held at any time upon call of the President by written notice mailed to each member five days before the meeting. Special meetings shall also be called by the President whenever required to do so in writing by any five or more members.

7. At any meeting of the Association ten members shall constitute a quorum for the transaction of business.

8. At the annual meeting of the Association, five Directors shall be elected of whom three shall constitute a quorum. There shall also be elected two auditors who shall hold office until the next annual meeting unless previously removed by a resolution of the members at a general meeting.

9. The officers of the Association shall consist of a President, Vice-President, Secretary, Treasurer, Manager, who shall be elected by the Directors at the first Board meeting to be held within a week after the annual meeting.

10. The Directors may select three of their number to act as an Executive Committee to have general charge of the affairs of the Corporation.

11. When a vacancy shall occur through any cause in any of the offices established by the by-laws of the Association, it shall be filled at the next meeting of the Directors.

12. The members at the annual meeting or at a general meeting may by by-law agree to pay the officers of the Association for their services.

13. Other by-laws for the guidance of the Association may be adopted, or the present by-laws may be amended by a majority vote of the members at any regular or special meeting of the Association.

In testimony whereof we have hereunto set our hands and affixed our seals.

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Dated at ..... this ..... day of ....., 19.....

(For Associations With Share Capital.)

PETITION.

To His Honour, J. M. GIBSON, K.C.,
Lieutenant-Governor for the Province of Ontario.

The petition of .....

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..... humbly sheweth as follows:

1. Your petitioners are desirous of obtaining by Letters Patent, under the Great Seal, a charter under the provisions of The Ontario Companies' Act, constituting your

petitioners and such others as may become shareholders in the Association thereby created, a body corporate and politic under the name of The , or such other name as shall appear to your Honour to be proper in the premises.

2. Your petitioners have satisfied themselves and are assured that the corporate name under which incorporation is sought is not on any public ground objectionable, and that it is not that of any known company, incorporated or unincorporated, or of any partnership or individual, or any name under which any known business is being carried on, or so nearly resembling the same as to deceive.

3. Your petitioners have satisfied themselves and are assured that no public or private interest will be prejudicially affected by the incorporation of your petitioners as aforesaid.

4. Your petitioners are of the full age of twenty-one years.

5. The object for which incorporation as aforesaid is sought by your petitioners is (*a*) to produce, purchase, sell and deal in fruit and other food, farm and dairy products and the various materials entering into the production thereof; (*b*) To manufacture, lease, purchase and sell all machinery, tools, implements, apparatus and all other articles and appliances used in connection with any or all of the purposes aforesaid or with selling or transporting the manufactured and other products of the association; (*c*) To carry on the business of refrigeration, cold storage, warehousemen, wharfingers, forwarding agents and preservers and packers of provisions of all kinds.

6. The Head Office of the Association will be at .

7. The amount of the capital stock of the Association is to be dollars.

8. The said stock is to be divided into shares of dollars each.

9. The said .....
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are to be Provisional Directors of the Association.

10. By subscribing therefor in a memorandum of agreement, duly executed in duplicate, with a view to the incorporation of the Association, your petitioners have taken the amount of stock set opposite their respective names, as follows:

Petitioners.	Amount of Stock Subscribed for.
.....	$.....
.....	$.....
.....	$.....
.....	$.....
.....	$.....
.....	$.....

Your petitioners therefore pray that your Honour may be pleased by Letters Patent under the Great Seal to grant a charter to your petitioners constituting your petitioners and such others as have or may become subscribers to the memorandum of agreement and stock book of the Association thereby created a body corporate and politic for the due carrying out of the undertaking aforesaid.

And your petitioners as in duty bound will ever pray.

Signatures of Witnesses. ..... Signatures of Petitioners.
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Dated at ..... this ..... day of ....., 19...

REPORTS FROM EXPERIMENT STATIONS.

SOUTHWESTERN FRUIT EXPERIMENT STATION.

By J. L. Hilborn, Leamington.

The season of 1908 was on the whole very satisfactory to the fruit growers of this locality. The past winter was very favorable for fruit trees, practically all of which came through in good condition, the only exception being peaches of the Crawford type, the fruit buds of which did not survive.

The peach trees planted at this station this season for experimental purposes, as also those planted in the orchard, made a very satisfactory growth. I now have trees of many varieties that have never been fruited here that are well started, and I hope some of them will prove of much value.

One block of peach trees, consisting of about 285 trees, planted in 1904, containing Golden Drop, Banner, Kalamazoo, and Engol, produced a good crop this season, the first three varieties yielded about equal in quantity, averaging about seven baskets per tree. The Kalamazoo was largest in size, followed by Banner, while Golden Drop was a little smaller. The Engol was larger and more handsome than any, but the trees were not loaded so well. One block of about 100 trees of Brigden, six years old, yielded about ten baskets only on the entire block. A few trees of New Prolific eight years old yielded a fair crop of peaches of very fine quality. A few trees of Lemon, Banner and Barnard yielded a full crop.

Varieties fruited this season as follows:

Dewey. First picking August 6th, last picking August 14th; grows somewhat like Triumph, but a much better peach in every way. Garfield began ripening August 28th, finished September 4th; produced just a few scattering specimens of very large size and fine appearance. Barnard began ripening August 31st, finished September 7th; tree a great bearer and fruit second to none in quality, but must be well pruned and well cultivated to get sufficient size to sell well. New Prolific ripened from September 2nd to 12th, an excellent variety. Engol ripened from the 7th to 14th of September; the best all-round peach I have seen. If I could have only one variety I would choose this one.

Kalamazoo ripened from September 14th to 24th; a heavy bearer of exceedingly uniform fruit of good size, and scarcely any culls among them; a good shipper, but not as well coloured or as good quality as some of the above varieties.

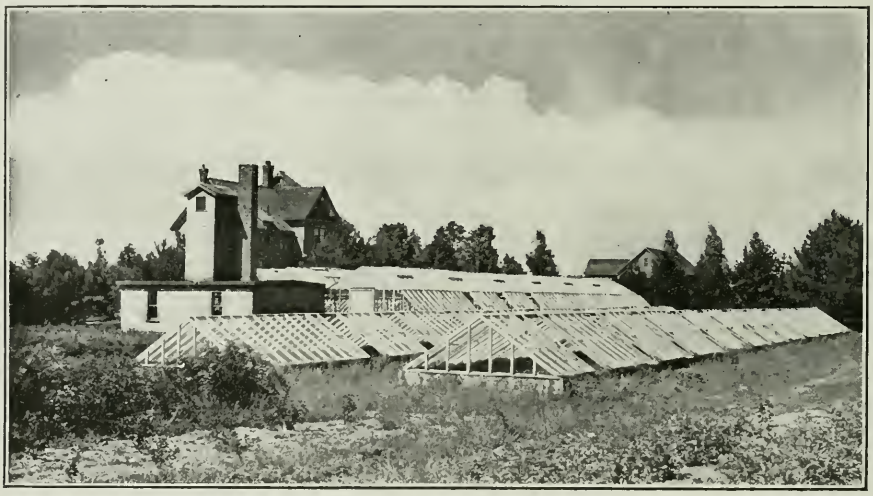
Banner is usually a little ahead of Golden Drop, but this season they ripened together, picking from September 20th to October 1st. Both varieties do well here if properly cared for and thinned when they require it. Lemon comes in with the last pickings. Of the two former varieties the latter is an excellent variety to grow for canning purposes.

Prices received for peaches this season, while only medium, were satisfactory, considering the yield. Nearly all the peach trees at this station made an excellent growth the past season, and those old enough to bear are well set with healthy buds. I still follow the practice of mulching every peach tree with old straw, and so far am well pleased with this method for this vicinity.

A portion of one young orchard was sown to Hairy Vetch on July 24th, which made an excellent stand, and is the most complete cover crop I have yet grown. Oats were sown in the bearing orchards as heretofore, but owing to the unusual dry weather did not grow well.

All my peach trees were sprayed during April with the lime-sulphur wash, except four rows in the centre of one orchard, which was treated same day with V 1 Fluid. The lime-sulphur gave excellent results as a preventive of curl leaf on peach trees, also in destroying San José scale on plum trees. The four rows of peach trees on which the V 1 fluid was used suffered much from curl leaf, and the portion of plum orchard that was treated with it to destroy the scale was quite badly infested on both wood and fruit, while the portion of the orchard that was treated with the lime-sulphur wash was comparatively free, and scarcely a scale could be found on the fruit.

Of the eighteen varieties of plums that were planted, all but two or three are growing well and should soon show some fruit. Of the various



Forcing Houses on Farm of J. L. Hilborn, Leamington.

varieties of cane berries, also currants, planted, most of them made a good showing for this, the first fruiting year, but require another year to be old enough for a report to be of any value.

The varieties of strawberries sent me were not suited to this soil and climate as we had a very severe drouth when they were ripening. They were almost an entire failure, and of little value as a test. Sample did best of any. From its behaviour this season, I think it is well worth a place among market varieties.

Vegetables.

This season was a very favorable one for the varieties of vegetables that are grown here. I have about 10,700 feet of glass used for vegetable growing purposes, part of which was planted to tomatoes and cucumbers early in March with good sized plants, the seed for which was sown early in January. The tomatoes grown were Chalk's Jewel, Dreer's Best of All,

and Frogmore, did best, in order named. The crop was hardly so good as it was the previous season, but was fairly satisfactory.

Four varieties of cucumbers were tested, Burpee's Extra Early, White Spine, Arlington, Satisfaction, and Telegraph. The latter is one of the long English varieties growing from 20 to 26 inches long. It is a heavier yielder than any of the others but does not take well in market. All the varieties of White Spine type did well. The cucumbers were trained upon woven wire trellises, while the tomatoes were tied to wire stakes.

In June I visited quite a number of the large greenhouses about Grand Rapids, Michigan, where they are well informed on this line of work, and are engaged in it on an extensive scale, and are certainly far in advance of anything I have seen before, especially in forcing cucumbers. I secured seed of the leading sorts grown there, and as I have put in a new and more up-to-date heating system, I hope to be able to report something more interesting another season in this line.

Early cabbage, tomatoes, and musk melons were all quite extensively grown, and were quite satisfactory crops this season. We grew a few Prizetake onions this season by starting the seed in the greenhouse about March 1st. These were transplanted in the field early in May, two rows, one foot apart, then leaving a space of three feet to admit of using a horse and cultivator. These grew well and produced a crop that astonished visitors. They were carefully harvested, and as they were larger and of as good quality as the imported onions found upon the market, they were crated and sold in competition with them and turned out satisfactory to all concerned.

An asparagus field of some three acres was started at this station last spring. 4,000 plants and a quantity of seed was secured from an asparagus specialist in New Jersey, who claimed to have a strain of extra quality. The roots were planted in early spring in rows four feet apart, plants 22 inches in the row. The seeds were sown in trays in the greenhouse the second week of March, and transplanted into permanent rows in the field the second week of June. Almost all the plants did well, and when killed by the frost in the fall, had produced five to seven shoots, each of which reached a height ranging from one to two feet, while the plants grown from roots had made about the same number of shoots, which ranged from three to four feet high.

WENTWORTH STATION.

By Murray Pettit, Winona.

Grapes.

The grape crop was below medium in quantity and much above in quality.

Fungus diseases were less harmful than usual. Although the quality was excellent, prices ruled lower than usual.

The financial depression, the proposed French treaty, and the temperance wave, each had an influence in lessening the demand.

Another year's experience proves that a great many of the varieties tested at this station are of little or no value. Even Campbell's Early,

Vineyard on Farm of Murray Pettit, Winona.

that gave promise of being a reliable early market grape, is lacking in hardiness, vigor, and productiveness. It does not ripen early enough to take the place of Champion, and not nearly as productive. The few vines planted in the experiment vineyard promised to be profitable. In 1902 a few hundred vines were planted with Champion, Concord, and Agawam, all getting the same treatment, and it has proved to be quite below the other varieties in profit.

In the experimental vineyard about 200 vines have been taken out. The following are the varieties with some reasons given for discarding them:

Amber:	Ripens too late for our climate.
Arnold's:	Black grape; productive; poor quality; sour.
Alvey:	Small black grape; poor quality.
America:	Vigorous vine; not productive.
Black Delaware:	Good quality; vine lacks vigour.
Black Eagle:	Early; does not fertilize well.
Black July:	Winter killed.
Beauty:	Light color; fair quality; not productive.
Canada:	Black; productive; poor quality.
Carman:	Vigorous vine; not productive.
Cottage:	Resembles Concord; drops badly from bunch.
Cynthianna:	Wine grape of Clinton type.
Cunningham:	Wine grape; not profitable.
Dracut Amber:	Productive; poor quality; very musky.
Duchess:	Small white; good quality.
Eldorado:	Vigorous vine; good quality; not productive.
Esther:	Weak vine: of no value.
Etta:	White; productive; poor quality.
Elvicand:	Black; vigorous; no value.
Early Ohio:	Tender; lacks vigour.
Early Golden:	Winter killed.
Elvira:	Very productive wine grape; bursts badly.
Eumedal:	Tender; winter killed.
Faith:	Small; weak; no value.
Florence:	The earliest grape; small; sour.
Green's Golden:	White; poor quality.
Golden Drop:	Very small; no value.
Geneva:	Winter killed.
Grayson:	Weak vine; no value.
Hays:	White; too tender.
Herbmont:	Small black wine grape.
Herman:	Wine grape; small berry; very late.
Ives:	Black; poor quality.
Jefferson:	Winter killed.
Janesville:	Black; early; sour.
Jessica:	Early; good flavor; lacks vigor.
Lady Washington:	White; large cluster; very late.
Lady:	White: early; good; lacks vigour.
Lutie:	Large; productive; very musky.
Martha:	White; good quality; weak vine.
Mo. Beisling:	White; productive; wine grape.
Marion:	Black; productive; sour.
Monroe:	Black; vine lacks vigour.
Montefiore:	Black; wine grape; sour.
Noah:	White; large; very productive; poor quality.
Norton's, Va.:	Small wine grape.
Oleite:	Winter killed.
Opal:	White; productive; poor flavor.
Ploughkeepsie Red:	Winter killed.
Pearl:	White; productive; poor quality.
Ronnell:	White; no value.
Rebecca:	White; good quality; not productive.
Taylor:	White, small; not productive.
Triumph:	White; large; too late for our season.
Transparent:	White wine grape.
Ulster Prolific:	Winter killed.

The following varieties are of some value and will be compared with the profitable varieties for a few years more:

Alice,
Amber Queen.
Anderson,
August Giant.
Cambridge,
Campbell's Early,
Concord Chassalas.
Concord Muscat,
Croton,
Dr. Collier,
Early Victor,
Eaton,
Empire State,
Eumelan,
Green Mountain,
Kensington,
Mason's Seedling,
Mills,
Moore's Diamond
Moyer,
Northern Light,
Pocklington,
Prentiss,
Rog No. 28 (Regal),
" 43 (Barry),
" 44 (Herbert),
" 39 (America),
Woodruff's Red,
Wyoming Red.

The profitable varieties:

Agawam,
Catawba,
Champion,
Concord.
Delaware,
Lindley,
Niagara,
Vergennes,
Wilder.
Worden,

Plums.

About forty varieties of plums have been tested at this station. Bradshaw, Lombard, Reine Claude, and Monarch have proved to be the most profitable.

General Hand, Washington, Satsuma, Ogon, Weaver, Desoto and Wickson are the least profitable.

Pears.

Pear blight has continued the work of destruction again this year. Anjou and Duchess have suffered very little. Bartlett, Flemish Beauty and Gifford have suffered the most.

The celebrated Pear Blight Remedy from California was experimented with, but with no very definite results. One Anjou tree planted in 1881 gave a yield of fifty-seven eleven quart baskets of good. clean, even sized pears.

BURLINGTON FRUIT EXPERIMENT STATION.

By A. W. Peart, Burlington.

Previous to and since this station was opened, in 1896, the kinds of fruit under test have been as follows:

Apples	67 varieties	Blackberries ...	22 varieties
Pears	46 "	Raspberries	29 "
Plums	54 "	Currants	30 "
Peaches	13 "	Gooseberries ...	6 "
Cherries	11 "		
Grapes	30 "	Total	308 varieties

Since 1896 several varieties have died, while others have been removed after a fair trial. Only a few pears, currants, and apples remain without a complete test, these having been planted somewhat recently. The comparative values of these so far is indicated by the reports of this year and 1907.

The aim of this report is to give the results and conclusions reached here at the present time, based upon a close and careful review of the past.

Apples

Of the older varieties (22 in number) the following appear the most desirable:

Commercial: Astrachan, Duchess, Wealthy, Ribston, Blenheim, King, Baldwin, and Spy.

Domestic: Astrachan, Sweet Bough, Gravenstein, Wagner, Seek, Tolman and Golden Russet.

Among the southern varieties (34 in all top-grafted in 1901) there is only one variety of promise, the Ozark, which during the past three years has averaged one bushel each year. It is a handsome winter apple, and is described in report of 1906. The remaining 11 varieties were grafted on Roxbury Russet stock in 1905, and have borne only an odd apple or so as yet.

The J. E. Johnston system of spraying was tried here on one acre of Spys and one acre of Baldwin, Ribston Pippin, and Duchess pears mixed. The results were encouraging. In sorting we found four-fifths of the Baldwins and Ribstons, and three-fifths to three-quarters of the Spys free from the codling worm and scab. The pears were practically clean, while those unsprayed in an orchard alongside were badly spotted.

Perhaps never in the history of the district has the codling moth done so much damage. In September, weather conditions were peculiarly favorable, and in some orchards apples were riddled with the worm. Young bearing trees suffered more than old ones, and as the season advanced the ravages were cumulative, late varieties being injured more than early sorts.

While conditions were extremely favorable to insect life, they were opposed to fungous growth, with one notable exception, the Greening apple, which in late September developed a grayish mould and rot that ruined it for all purposes except evaporation, etc.

Pears.

These seem suitable for this district:

Commercial: Wilder, Clapp, Bartlett, Boussock, Louise, Duchess (dwarf), Anjou, Kieffer, Lawrence, Nelis, Josephine.

Domestic: Wilder, Bartlet, Seckel, Louise, Anjou, Nelis.

In regard to "blight," the following observations may be of interest. Three trees of each variety were planted in 1896 on a sandy gravelly loam, fertile and under cultivation.

All the trees blighted: Idaho, Petite Marguerite, Howell, Souvenir de Congress, Summer Doyenne, Clapp's, Easter Buerre and Osband's Summer.

Some blight: Lawson, Josephine, Sheldon, Boussock, Vermont Beauty, Anjou, Bartlett, Duchess, Hoosic, Louise, Buffam and President Drouard.

Practically free from blight: Lawrence, Clairgeau, Nelis, Bosc, Wilder, Keiffer, Giffard, Tyson, Sudduth and Seckel.

Note.—Bartlett, Anjou, Duchess and Sheldon growing on heavier soils have blighted but very little, so that those in first and second columns might make a different showing if grown on clay soil. Rapid growth induces greater blight, while some varieties are constitutionally susceptible. The Kieffer pear, and perhaps some others seem to prefer a sandy loam, but for most pears, a heavy soil appears to be their natural home.

Plums.

The following do well: Bradshaw, Niagara, Imperial Gage, Lombard, Yellow Gage, Prince of Wales, Glass, Reine Claude, for European varieties; and Red June, Abundance, Burbank and Satsuma of the Japan type.

Concord Grapes in Bearing at A. W. Peart's, Burlington.

Relative duration of life. These might be classified as long-lived: Bradshaw, Niagara, Yellow Gage, Glass, Purple Egg, German Prune, Shipper's Pride, General Hand, Munro, Gueii, Pond's Seedling, Weaver, Shropshire, Damson, Chabot, Burbank, Ogon, Abundance, Prince of Wales

and Peter's Yellow Gage. Short-lived: Imperial Gage, Reine Claude, Lombard, Purple Egg, Yellow Gage, Smith's Orleans, Satsuma, Moore's Arctic, Grand Duke, Czar, Saunders, Spaulding, Fellenburg, Wickson, Willard, Washington.

As the Reine Claude gets older it seems to ripen earlier—a transition from a late to a medium season. The Weaver, Mariana, Italian Prune, and General Hand are practically useless, bearing little or no fruit. As the Ogon and Wickson become older the bearing habit appears to desert them. If you want plums quickly you might plant some of these varieties that die early but in the long run you will get good satisfaction from the Bradshaw, Niagara, Hudson River, Shipper's Pride, etc. When we go to pick the German Prune most of them are found lying on the ground.

Peaches.

Of the trees planted in 1897-98, these varieties are living and fruiting: Crosby, Steven's Rareripe, Longhurst, Tyhurst, Sneed, Champion, Hortense Rivers, Yeusti Triumph, Greenboro, Captain Ede, Connecticut, Alexander and Early Crawford.

Commercial: Sneed, Alexander, Early Crawford, Champion, and to judge of reports from others in the district, the St. John, Elberta and Smock.

Grapes.

Commercial: Black—Moore's Early, Worden, Concord; Red—Delaware, Massassoit, and Lindley; White—Diamond and Niagara. Perhaps the most satisfactory all-round grape grown here is the Worden. It is earlier and larger than the Concord, yields nearly as well, is very hardy and of excellent quality. The skin is thin, but for nearby markets that cuts very little figure.

In regard to the keeping qualities of different grapes, the writer made a test some years ago of twenty varieties. They were picked well ripened in September and October, and kept in baskets hung up in a cool dry cellar.

The following table shows their record:

Variety.	Tested Jan. 1. Scale 0-10.	Tested March 15. Scale 0-10.	——
Agawam	9	9	Wilted, good flavor, nearly sound.
Brighton	9	5	Partly decayed, partly sound.
Catawba	10	10	Wilted, good flavor, sound.
Concord	3	....	Entirely decayed.
Delaware	5	....	" "
Eldorado	7	1	Nearly all decayed.
Eaton	4	....	Entirely decayed.
Hartford	6	6	Partly sound.
Isabella	7	1	An odd sound berry.
Jessica	7	2	A few sound berries.
Lindley	9	8	Wilted, fair flavor, nearly sound.
Lady	2	....	Entirely decayed.
Moyer	7	2	A few sound berries.
M. Diamond	7	....	Entirely decayed.
M. Early	3	....	" "
Niagara	3	....	" "
Worden	1	....	" "
Wyoming Red	7	....	" "
Wilder	8	8	Nearly sound.
Vergennes	10	10	Wilted, good flavor, sound.

This test would go to show that the Catawba, Vergennes, and the Roger varieties, Agawam, Wilder and Lindley are the best keepers.

Cherries.

Commercial: Sour, Dyehouse, Early Richmond, Montmorency, and English Morello; Sub-acid, Windsor. Two varieties, Louis Phillipe and May Duke, planted in 1900, are still practically barren. It is possible that, like the Spy apple and the Tyson pear, they may require age before beginning to fruit.

Blackberries.

Commercial: Snyder, Agawam and Western Triumph. The Ancient Briton promises well, but appears to be weak in self-fertilization, and would require to be planted with other varieties. Description of varieties will be found in report of 1904, and for average yields, from 1903-1907 inclusive, see table in report of 1907.

Currants.

Commercial: Red—Cherry, Fay, North Star, Prince Albert, Victoria, Wilder. Black—Collin's Prolific, Lee, Naples and Saunders (with some growers Champion takes a first place in this district). White—Grape and Imperial.

Yields of Currants in Quarts per Bush for Years 1902-1908, Inclusive, with Average per Year.

Variety.	1902	1903	1904	1905	1906	1907	1908	Total in 7 years.	Av'ge per year.	Remarks.
Baldwin	.....	.....	.....	¼	1	½	½	2¼	.32	Planted 1903.
Belle St. Giles	2½	1½	1	1	2	2	1	11	1.57	
Black Victoria	.....	.....	.....	½	1½	1	½	3½	.50	" "
Boskop's Giant	.....	.....	.....	¼	1	1½	2	4¾	.67	" "
†Brayley	3	4	2½	4	2	3½	3	22	3.14	
*Beauty	.....	.....	.....	⅓	1	2	2	5⅓	.76	" "
Champion	.....	.....	.....	.....	½	1	1½	3	.42	" 1904.
Comet	.....	.....	.....	½	1	3	¾	5¼	.75	" "
Cherry	4½	5½	4	5	3	4	3½	29½	4.21	
Collin's	2½	5½	4	4	3	2½	2	23½	3.35	
Crandall	4	4½	5½	4	3	3½	3	27⅞	3 92	
Fay	3½	4	2½	3½	1½	3	1½	19½	2.78	
Lee	3	4	2½	3	1½	2½	2	18½	2.64	
Naples	3	4½	3	4	3½	3	3	24	3.42	
New Victoria	4½	5	5	5	3	5	2½	30	4.28	
North Star	4½	5½	2½	4	2	5	3	26½	3.78	
Perfection	.....	.....	.....	½	1	2	½	4	.57	
Pomona	4½	4	3¼	4	3	4	3	25¾	3.67	
Prince Albert	4	4½	4	5	3	4	2	26½	3.78	
†Raby Castle	5	6	4	5	3	5	3	31	4.42	
Red Cross	4	4½	3¼	2	1	3½	2	20¼	2.89	
†Red Dutch	6½	7½	4	3½	2	4	3½	31	4.42	
Red Victoria	6	7	5	5	3	5	3	34	4.85	
Saunders	3	5	4	4	2	2	2	22	3.14	
Standard	.....	.....	.....	½	1½	1½	1½	5	.71	" 1903.
Success	.....	.....	.....	¼	1	1	1	3¼	.46	" "
Versailles	3	4	3	2½	2	4	2	20½	2.92	
White Grape	4	5	2½	3	2	3	1	30⅗	2.92	
White Imperial	3	4	1½	1½	1	2	½	13½	1.92	
Wilder	4	5½	4	5	2½	5	3½	29½	4.21	

*These yields taken from bushes recently planted.
† Rather small, yet they give a heavy yield.

Raspberries.

Commercial: Red—Marlboro, Cuthbert and possibly the Herbert, which is said to be promising: Black—Smith's Giant, Kansas and Older: Purple—Columbian and Shaffer: Yellow—Golden Queen.

Gooseberries.

Commercial: Pearl, Downing, and Red Jacket.

Comments. It should always be borne in mind that the fruit industry of this Province is essentially in an experimental stage, and that conclusions we reach to-day are subject to revision. Considerable light has been thrown upon some problems, such as varieties of fruits, care of trees packing, marketing, etc., while others are still rather obscure, as the most suitable soil for a given kind of fruit, variation in soils for different varieties of the same fruit, the proper fertilizers to use for the several fruits on a given soil, etc.

The following impressions are submitted: Fruit growing demands first-class drainage. Perhaps apples and plums are the most cosmopolitan of our staple fruits and flourish over a wider range of soils. Apples thrive best on sandy, gravelly and light clay loams; pears on clay loams; plums on sandy, gravelly and light clay loams (about the same as apples), peaches on rich sandy loams; grapes on clay loams; cherries on high, sharp, gritty, gravelly soils; blackberries and raspberries on sandy loams with a damp, but not wet sub-soil; currants on light clay or heavy gravel loams; strawberries on rich, soft, mellow sandy loams.

The adaptability of some fruits is limited to a very narrow area, due to soil, exposure, elevation, climate, atmospheric causes and the inherent special needs and peculiarities of the fruit itself.

MAPLEHURST FRUIT STATION.

By Linus Woolverton, Grimsby.

Cherries.

The season has been on the whole favorable. The early rains gave the trees vigor, and dry weather after the setting of the fruit prevented the spores of the cherry rot from developing, so that the fruit was bright and clean. Some seasons, such varieties as Napoleon and Tartarian must be picked on the green side to carry at all, and even then will show many moulded and rotted fruits if left standing over night. But this season our cherries could be picked in perfect maturity and shipped long distances in safety.

Spraying with lime and sulphur any time previous to the opening of the buds is becoming more and more practised every year in the Grimsby district. This is not for scale, for we have no scale, but as a preventive of rot, scab, aphis, and other evils. Our growers find this spray so useful that they cannot afford to omit it; some even claiming that where orchard and vineyard is thoroughly sprayed with the lime-sulphur spray in spring, it is unnecessary to use the Bordeaux afterwards. Of course, it was the fear of the San José Scale that led us to begin the use of this spray, but now we have ceased to fear it, for it is an effective preventive.

The time of ripening of the various kinds was much earlier than in 1906. Governor Woods began last year the beginning of July, whilst this year they began the 20th of June, and other varieties relatively early.

Prices have not ruled as high for cherries as in 1906, but have been satisfactory. The following is a record of prices according to dates, the fruit being sold in eleven quart baskets by the Manager of our Grimsby Co-operative Fruit Growers:

Prices of Cherries. June 22, white, 60c.; June 23, 54c.; June 26, 57½c.; June 29, 70c.; June 29, bla k, $1.00; June 30th, 75c.; July 1st, 74c. July 1st, white, 60c.; July 2nd, 80c.; July 2nd, black, 80c.; red, 67c. July 3rd, black, 87c.; July 6, $1.00; July 6, white, 66c.; red, 70c.; July 7, red, 73c.; black, 96c.; white, 74c.; July 8, white, 70c.; black, $1.05; Windsor black, $1.05; July 9, Windsor black, $1.11; red, 77c.; July 10, red, 82c.; Windsor, $1.21; July 13, black, $1.19; red, 79c.; July 14, red, 79c.; Windsor, $1.27; July 15, red, 83c.; July 16, red, 83c.; July 20, red, 97c.

The above are net prices to the grower. The baskets are the regular eleven quart; we have given up the half basket as doubling the package bill without any advantage in selling price.

The cost of picking cherries has been higher than usual for two years past, owing to scarcity of pickers. The usual average price paid in previous years was 15c a basket or by day work, if picking were bad; but last year many growers paid 25c. a basket for picking and this year 20c. was the ruling price.

Cultivation and pruning of the cherry are more and more practised, because where grown in sod the trees are less fruitful; indeed, the care and cultivation of the orchards has wonderfully improved during the past few years, and the orchards here about are showing signs of prosperity and attracting much attention from our many visitors. Fruit land is wonderfully increasing in value, especially in the peach and cherry districts.

Notes on Varieties.

Choisy: Duke; trees twelve years planted, showing signs of age, one tree dead; not very productive; a small crop of fruit, very sweet and delicious for eating; ¼ crop, season, June 24th to July 6th.

Cleveland: Heart; no crop, tree in grass; ripe June 20th.

Coe: Heart; very small crop.

Downer: Harvested, July 10th; small crop, not worth gathering for market, sweet and excellent for dessert; tree very vigorous, strong growing spreading habit; not recommended.

Dychouse: Kentish Pie; very fine and tree very productive; picking just before Richmond.

Eagle: Heart; fairly productive this year, of beautiful large sweet black cherries, but went too soft at maturity for shipment; unprofitable; not recommended for even the home garden; gathered what were fit for shipping on July 6th; closely follows Tartarian.

Elton: Bigarreau; full crop of good fruit, without any sign of rot, which is unusual for this otherwise excellent dessert cherry; recommended for home garden.

Eugenie: Duke; trees twelve years old, showing signs of debility; about a half crop, free of rot, harvested June 24th.

Grenner Glas: Tree not very productive; no crop.

Griotte de nord: Tree strong grower, fruit ripe July 2nd; productive, but not equal to Richmond.

A well tilled orchard in the Niagara District.

Hortense: Duke; no crop; of other trees planted in 1896, one is dead; the finest and largest of the Dukes; very spreading and very strong; needs further trial on different soil and under other conditions.

Knight: Heart; tree the largest and most healthy in my experimental plot; about thirty feet high, and about fifty years planted; very productive; yield this season, 15 baskets or about 165 quarts, of very fine black cherries, which sold at about $1 a basket.

Koslov: I imported from Russia about ten years ago some fifty trees of this variety, and gave a part to the Central Experimental Farm. My trees have never grown more than five or six feet high, and I believe they could be grown profitably planted by the acre in rows about six feet apart, or about six or eight feet apart each way. Certainly their dwarfish habit would much facilitate spraying and harvesting. The fruit much resembles that of the English Morello.

Late Duke: Duke; a small crop of very fine cherries; excellent for sauce and pies. Plainly one must not depend on any one variety of cherries for profit. For two successive years these were the most productive of the Duke, but for two seasons now they have given a very small yield.

Magnifique: Duke; small crop; season about August 1st.

May Duke: Duke; trees healthy, usually productive, but this year no crop.

Mezel: No crop; has not sustained its reputation; I should now be inclined to rank it second class in market value as a variety.

Montmorency: Usually the finest and most productive of the Pie cherry class; this season the crop is only medium, and the trees do not show quite their usual thrift, perhaps owing to being planted too closely.

Morello: Trees beginning to recover from weakening effect of over production three years ago; a fair crop of nice marketable cherries.

Napoleon: Bigarreau; tree productive; gathered July 2nd; full crop; no rot; still a leading market variety.

Orel: Pie; ripe July 6th; fine load of fruit; much like Purity or Dyehouse; very hardy.

Olivet: Duke; tree not very productive; very moderate crop; fruit fine and large, dark red; gathered July 6th.

Purity: Pie; ripe 6th July, along with Dyehouse, probably identical with the latter.

Russian 207: Morello; still gives promise of being valuable (See preceding reports.)

Red May: Too unproductive.

Royal Duke: No crop.

Richmond: Pie; ripened early in July; trees not quite as vigorous as Montmorency; very full crop.

Spanish: The strongest grower of the Bigarreau class; usually subject to the cherry rot, but this season quite free; fruit very large and very attractive; ripe beginning of July.

Schmitz: Bigarreau; a beautiful large black cherry, and the tree is a wonderful grower, but though planted twelve years in my experimental plot, it has never yet borne more than a few scattered specimens. I therefore conclude that it is valueless as a commercial variety.

Strauss Weichsel: Pie; tree bearing a medium crop, fruit red, mild acid, not as large as Richmond, not worthy of a place in our orchards.

Tartarian: Heart; trees have made a fine vigorous growth; some trees in my experimental plot are about fifty years planted, and though now

beginning to fail, have this season yielded a fine crop of very fine marketable cherries without a sign of rot or curculio. Harvested July 30th.

Windsor: Bigarreau; trees very vigorous; I have topped them from 15 to 20 feet high, lest they grow out of reach of spray and picking basket; productive; fruit large, firm, dark, very saleable, shows the benefit of the lime sulphur spray; unfortunately this cherry has a tough skin when cooked.

Wood: Heart; old trees, fifty years planted, now failing; not so productive as formerly; fruit ripe about the 20th of June. The best early cherry for all purposes.

Classification of the Cherry.

There is so much confusion in nurserymen's catalogues of the varieties of cherries that some more careful classification is desirable. The best I have met with during the past ten years of my study of fruits, is that of Professor Bailey, of Cornell University, which is as follows:

Sour Cherry Class.

1. *Amarelles* (Kentish or Pie), this latter being a term used by Downing for these varieties; a type with pale red fruits, which are generally flattened at the ends, and an uncolored juice. Here belong the Montmorency, Richmond, etc.

2. *Morellos*, with very dark red fruits, which generally vary from spherical to heart shape, and a dark colored juice. This type includes the Morellos, Ostheim, Wragg, etc. (The word Morello is from the Italian, and means blackish, and evidently should not be applied to such varieties as Early Richmond.—L. W.)

Sweet Cherry Class.

1. *Mazzards*, as the seedlings used by nurserymen.
2. *Hearts;* such as Tartarian.
3. *Bigarreaus*, such as Yellow Spanish, etc.
4. *Dukes*, such as May Duke, etc.

REPORT OF SIMCOE FRUIT EXPERIMENT STATION.

By G. C. Caston, Craighurst.

There was no new stock planted this year here for experimental purposes. Fruit trees and small fruit came through the winter in fairly good condition. Strawberries were a fair crop and raspberries and blackberries much better than last year. There was a medium crop of cherries on the few sound trees that are left. Pears were only a light crop, and it is doubtful whether they will ever pay as a commercial orchard fruit here, although they are remarkably free from blight. But yet they do not bear here as they do in more favorable sections. Plums of the European class may be regarded as a failure here. I have tested about 40 varieties, and they have practically all failed, although I have had a few good crops from some of them, yet as soon as they reach bearing age they fail, and the only way to have a few good plums here would be to keep continually planting as they die off, and this would not pay.

Duchess apples were a full crop and of good size, and of very fine quality. The early and fall apples seem mostly all shipped to the west, and although the very warm weather prevailing during the harvesting of their varieties made the shipping somewhat risky, yet they landed in good condition. The shipping qualities of our northern apples are extra good.

My plantation of strawberries is now very small, as I was not satisfied with the varieties I was growing, and am continually testing new ones. I have also been raising some seedlings of my own, and some of these I thought very promising, yet on further trial did not come up to expectations. Out of a good many tested, there are none I think worthy of propagation. I have one of very superior quality as to flavor, but it is not productive.

Of the new varieties sent here last year, the most promising by far is the Three W's. This is a fine healthy vigorous plant, evidently productive, and the fruit is large and fine. If this variety on further trial comes up to expectation, it will be one of the leading commercial varieties. Next in order of merit are Senator Dunlap and Glen Mary. For the last few years Williams has been the best all-round berry.

Blackberries were a very good crop here, better than for some years past. The dry season previous prevented a rank growth of canes, so that they wintered well. This would be a great section for blackberries if the climate was just a few degrees milder in winter. In all other respects they thrive wonderfully. If we could get a variety as good as Eldorado and as hardy as Snyder, it would be a great acquisition here. I tried bending the canes down with poles, leaving the poles on top of them, and while it gave the necessary protection, the canes were badly broken. Blackberry canes would not stand the bending like the raspberry. The next best plan is to keep the canes headed low and trust to the deep snow to give the necessary protection.

I have tested a new variety sent out last year named the Mercereau. It fruited this year, and the fruit is very fine to look at, but so strongly acid as to put it out of the list as a dessert berry. How it would class for canning I do not know, but would require a lot of sugar, I fancy, to make it at all palatable. So far, I would not recommend it at all. If I could not grow a better flavored berry than that I would not grow blackberries at all.

The Agawam is the best all-round of the good varieties tested here so far, very tender and very subject to anthracnose. So I would place Agawam first.

Raspberries were very good this year, and the Cuthberts did not suffer from winter injury as much as usual. This was no doubt owing largely to the severe drouth in 1907, which prevented the usual rank late growth of canes.

The Herbert raspberry, about which good claims are made as to hardiness, productiveness, quality, etc., I have applied for several times, and last year plants were ordered by the secretary to be sent to each of the stations, but none of them came here. However, I obtained 50 plants myself on my own account, and these fruited this year. The canes seem to be quite hardy. It is productive, the fruit is large, larger than the Cuthbert, but when they say it is of better quality they are wrong. In my opinion it will be many days before a better all-round berry than the Cuthbert is produced. It is just a little too tender for our northern winters, that's all.

But I am well pleased with Herbert. It will fill a long felt want on account of the hardiness, combined with good appearance, size and productiveness. I have one from Michigan, the Eaton. It is productive; the canes are short like Marlboro, and seems quite hardy. The fruit is rather

acid in taste. It will never figure as a dessert berry, but it is the largest berry in cultivation, probably. At least I have never seen any approaching it in size. The wild raspberries grow in such abundance that there is little local demand for cultivated ones; but they can be shipped at satisfactory prices to the large cities and towns.

There was sent to this station in the spring of 1907, several varieties of currants—Victoria, Naples, Champion, Fays, Cherry, Wilder, Versailles and White Grape. These were so carelessly packed that they arrived with the roots so dry that only a few of them lived. However, these varieties had all been grown before, and I may say that all of them can be grown well here. However, there was formerly no local demand for these fruits, but now they can be grown and shipped at a profit, owing to the higher prices prevailing the last few years. Anyone desiring to grow this class of fruit can grow any of them well by giving the proper care and cultivation. I would prefer for Red—Fays, Cherry, and Versailles; for White—the White Grape, and for Black—Naples, Victoria, and Saunders.

I have a few new varieties—Boskoop Giant, a new black currant, but it requires further trial. I fancy it will be no improvement on some of the older varieties.

Cherries.

I am very much disappointed with the results with cherries. I am now satisfied they will never be profitable as a commercial crop here, although there is a greater demand for them locally than for any other fruit. If the section of land planted to cherries had been planted instead with some good commercial variety of apple, I would be hundreds of dollars in pocket. Instead of a thrifty block of cherries, I have a lot of unsightly gaps, with here and there a few survivors. The gaps I am filling up with apples. Among the survivors which bore a crop this year are Russion 207, Orel 24, Bessarabian, Litham, Ostheim and Montmorency. A row of young Montmorency has fruited for the first time this year. The crop was fine, considering the age of the trees, but already several gaps are seen in the row. I would place Orel as the best of the dark colored varieties for this section, and Russian 207, Bessarabian and Montmorency as the best of the reds. But as regards cherries and plums, we may as well acknowledge that they can never be grown profitably in the northern parts of the Province very far inland from the great lakes, and the sooner we regard that as an established fact the better.

Out of a number of pears tested here, the Flemish Beauty and Clapp's have proved the hardiest and most thrifty. Flemish Beauty, however, is of little use unless thoroughly sprayed. It will bear well, but scabs badly. Clapp's, on the other hand, is remarkably clean in foliage and fruit, and all varieties tested so far have been very little troubled with blight. Bartlett does fairly top worked on Flemish Beauty stock. The Sudduth pear from Wisconsin thrives and bears well here, but is very small and of poor quality. Bosc, Wilder, Dempsey, Gifford, Idaho, Duchess, Clairgeau, Sheldon, Lawrence and a number of French pears have been tried here and cannot be recommended. I do not think it would be advisable for any one to plant a commercial orchard of pears in this locality, and any one wishing to grow a few for home use should plant Flemish Beauty, providing they will spray it well. And I might say right here that if there is any better pear in fruit or quality than the Flemish Beauty, when clean and well grown, I have never yet seen it. The list might include a few trees of Clapp's, Bartlett and Anjou.

Apples.

If there is any one thing I would like to impress more than another upon the people of the Simcoe district, it is the importance of top working Northern Spy and others of the best commercial varieties on hardy stock. And of these the Spy should have first place. For so far as the home market is concerned, the Spy is, and I believe always will be, the leading winter apple of Ontario. By the home market is meant, of course, our own Dominion, and especially the northern districts and the great Northwest; and the conditions usually governing the sale of car lots of winter apples for this great market, are that they shall consist of from 25 to 40 per cent. of Northern Spys. Everybody who wants winter apples want Spy, and we have not nearly enough of them in this district. I would say to intending planters, make your orchard ninety per cent. Spy, and do it by top working them on hardy stock—Tolman Sweet, Wolf River and such hardy kinds. I have some fine Spy tops worked on Yellow Transparent, and on some of the Russian varieties; but probably there is nothing better than Tolman Sweet for this purpose. I have not failed to notice that Spys from the Lake Erie district at the fruit show in November are, while richer in color and attractive looking, quite ripe and mellow in November, while ours, though not so rich in color will be found as crisp and firm and sound in March as when picked from the tree. Shipping and keeping qualities are bound to tell in the apple trade, and so I would earnestly advise our people to grow more Spys. It will do better here top grafted than King, Baldwin or Greening, and as it is always in demand, why not grow it?

While the Baldwin, King, and Greening can be grown here by top grafting, it would not be advisable to grow these so extensively as the Spy for the reasons already mentioned. However, if we are growing apples for export trade, we would require to have some Baldwin and King. But I believe our northwest trade will be the best one to look to in the future, and for that trade we require to have some good varieties of early and fall apples, and our section cannot be excelled in these. Then, for winter sorts, we require a good proportion of Snows and Baxter. These two go together, and may be called early winter sorts, good until January. After these we have Stark, Pewaukee, Canada Red, Seek, and Spy. These would make a good selection for a car lot of winter varieties, all of them late keepers, and eliminates Baldwin, King, and Greening. These last are rather tender and uncertain. I am doubtful if King will ever pay; although sure of a good price, it is such a poor bearer. Baldwin will bear well, but is so tender even when top-worked, that it is uncertain. Greening does fairly well here top-worked, and being a first-class winter cooking variety perhaps should not be left out, although inclined to be a little tender.

We had a splendid lot of fall apples in this section, and although nobody sprays their orchards, the fruit was fine and clean. The principal varieties were St. Lawrence, Colvert, Wealthy, Alexander, and Wolf River. Then there was a good crop of Snows of very fine quality, also a fair crop of Baxters, and these two were fine, clean and bright.

Snow. In my report last year I suggested the growing of Shiawassee Beauty instead of Snow, owing to the liability of the latter to scab. But after the experience of this year, I would hardly recommend that now. But if our people could be persuaded to prune and spray their Snows we could have them as prolific and of as fine quality as in the St. Lawrence Valley or anywhere else. The Snow is so well known and so universally appreciated as a dessert apple, that it is not likely to be supplanted by any other of its sea-

son, so long as it can be grown as fine as it was this year, and this can be done by proper attention to careful pruning, spraying and cultivation. It is quite hardy here, and I would advise intending planters to keep a fair proportion of Snows in their orchards, and, if well cared for, they will never go begging for a market.

One has to be very careful about recommending any new varieties of fruit until their qualities are thoroughly established by extended trial. The Boiken apple, that I had a good opinion of a few years ago is likely to be a very profitable winter apple on account of its very early and regular bearing. The apple had no decided flavor or quality, yet it was attractive looking and

Wolf River Apple in Bearing on the Farm of G. C. Caston, Craighurst.

a long keeper, but has turned out like most of the plum trees, bore a few crops and then collapsed. I cannot recommend it for the section at all.

Canada Baldwin. This is a promising variety, medium size, but bright red color, attractive, much better flavored than the old Baldwin. Tree a thrifty upright grower, sound and healthy so far. I think this apple will be an acquisition.

Baxter may be regarded as a standard here, comes in nicely with the Snow and shipped at the same time. A large attractive apple of good cooking quality; sells well everywhere.

Bismarck, fruited for the first time this year. Fruit large red, resembles somewhat Alexander. No dessert quality, coarse in texture, season late fall. The tree bears heavily while quite young, which is about its only advantage over other sorts of the same season.

Gano. Decidedly not recommended. I planted part of a new orchard with Gano three years ago. I would not do it again, and would advise intending planters here to have nothing to do with either Gano or Ben Davis. They are both tender and short lived in this section, and you should grow something of better quality.

McIntosh. Do not let any one be persuaded to plant this in preference to the Snow in this section, as it would be a great mistake. You need to keep a spray pump under the tree to keep it clean, and it bears so irregularly and withal so poorly. Far better plant Snow. McIntosh has been overestimated.

Stark. This variety continues to do well here, and may be regarded as one of the standard winter apples for this section. It does not need to be top-worked, as it is quite hardy.

Seek no Further. This is an excellent long-keeping winter apple, and ought to be more extensively planted; it seems to be quite hardy here.

Peerless. Some nurserymen are advertising this apple as a winter variety. It is nothing of the kind. Although in ordinary seasons it keeps well until November, yet it is a September apple, ready to pick and pack very soon after Duchess. This clean-skinned, bright, attractive apple, unequalled as a cooker, should work in well for the Northwest trade coming next after Duchess. The tree is hardy, not a fast grower but a regular bearer.

Ontario. Has failed as a tree. Doing fairly well top-worked, but I am somewhat disappointed in it, and do not recommend it any more.

Blenheim Pippin. This apple thrives well here. Seems to be quite hardy, but does not bear regularly. Bears well, however, in alternate years. Worthy of a place on list of fall apples.

Ribston Pippin. This apple produces the greatest amount of bloom and fewest apples of any variety I know. Practically useless here.

St. Lawrence. Any one who will spray thoroughly will find this old variety a profitable apple to grow. It has excelled itself this year. A splendid crop of clean, bright apples everywhere throughout the section. No one need be afraid to include a few trees of this variety in their list of fall apples.

Insects and Fungi.

The worst insect pests of late years are codling moth and oyster shell bark louse. Nothing is being done to check these pests and orchard and fruit suffer. I purpose using this lime sulphur wash for spraying with next year, as from what I can learn it is quite effective against the bark louse and one of the best fungicides as well. The principal fungous disease is apple scab, though some orchards of late years have been affected with twig blight, which seems worse in some seasons than others. There is also some canker in orchards too close planted.

Cultivation. I left my oldest orchard in sod for two years, and would not do it again. Orchards in this section where we are subject to such severe drouth as we had last year, should be continuously cultivated. They need all the moisture they can get and more during summer. A cover crop is not of much importance here as snow comes early and usually lies deep until spring.

LAKE HURON FRUIT STATION.

By A. E. Sherrington, Walkerton.

I have the pleasure to present herewith for your consideration my report of Fruit Experiment Station for 1908:

The Season.

The winter of 1907-8 was quite mild, with a good blanket of snow in this district; hence all plants came through in fine condition. The spring was somewhat backward and cold, but there was plenty of rain. When warm weather did set in, May 1st, growth was very rapid. The rainfall was quite heavy during the early part of the season, and up to August 19th; from that date no rain fell until September 28th. From April 1st to November 1st we had 16.6 inches of rainfall. The last killing frost occurred on April 30th, and the first killing frost was October 3rd. The highest temperatures were on June 22nd, 90 degrees in the shade, and on August 29th, 92 degrees in the shade. The lowest temperature during this time was on the 16th of April, 11 degrees of frost, and the lowest temperature up to December 25th was 13 degrees above zero. So on the whole the season has been a fairly favorable one for the fruit grower, with the exception of the hot dry spell during the latter part of September and October, which destroyed the keeping qualities of the apple.

No new work was taken up at the station this season, probably owing to the change in the management of the stations and the pressure of work at the new Experimental Station at Jordan Harbor. Sixteen varieties of Dr. Saunders' Hybrid currants were added to the collection. They were furnished by the kindness of Mr. Macoun, of the Dominion Experimental Farm, Ottawa. No other planting was done except a few apples, pears, plums, and cherries, and they were mostly where trees were damaged by frost, blight or were undesirable varieties. These were to replace others. Quite a number will be removed next spring and replaced by other sorts. This has been done at my own expense. Considerable top-grafting has been done with good results, but others were rather disappointing. The Keiffer pear as a stock for top-working other varieties on has not been as satisfactory as I expected, but further experiments are needed along this line before definite information can be given.

Owing to the increased interest being taken in the fruit industry, the volume of correspondence has been greater this season than ever before. Inquiries have been received regarding methods of cultivation, spraying insects, varieties and where to obtain them. These inquiries are not only from various parts of Canada, but from many parts of the United States. This is one part of the experimental work that is far reaching, and speaks well for the industry.

Insects.

Codling Moth, the most destructive insect that the fruit grower has to contend with, was not any more prevalent than other seasons. Where orchards are properly cultivated and sprayed, this insect can be controlled and nearly eradicated in a few years, if growers and farmers will co-operate and practice clean cultivation, removing all brush, grass, old fences, rough bark from the trees and rubbish around the orchard and spray thoroughly at the right time.

May Beetle. This insect is becoming quite a serious pest in this district. The larva of the insect is causing considerable damage, not only to the strawberry crops, but the potatoes as well. The mature beetle was especially numerous this season.

Tent Caterpillars, Tussock moth and all other insects are well under control in the district.

Fungi.

The apple scab or black spot was not so bad during the past season as some seasons previous. The pear or fire blight was very destructive, both to pears and a number of apples. The varieties of apples that appear to be subject to the blight are, Fameuse, Alexander, St. Lawrence, Colvert, and a number of the new varieties. It appeared to attack those in bloom much more so than the trees not in bloom. If this disease continues the pear industry will be wiped out in Ontario.

Very little rot or black knot was found on the plums or cherries at the station, but the plums and cherries throughout the district will soon all be destroyed by the black knot. We find very little trouble in controlling the knot. Both the plums and the cherries are treated alike. They are both sprayed before growth starts in the spring with either 2 lbs. of copper sulphate to 50 gallons or one barrel of water, or 20 lbs. of copper sulphate (Bluestone) 60 lbs. fresh lime to 200 gallons of water. Then before the bloom opens they are sprayed again with the Bordeaux mixture, and the third spraying is done when the cherries are about the size of peas, or just after they are out of the calyx, and if any knot is found on the trees during the growing season it is cut out and burnt.

Strawberries.

About two acres of strawberries are grown at the station as a commercial plantation. The varieties grown are about half Williams and Brandywine. Brandywine has been about the best berry here. It is a strong vigorous grower and healthy, and makes a good row; fruit large and of the finest quality. A heavy yielder. Williams is also a strong vigorous plant, heavy cropper, fruit large, quality good for canning; first-class shipping berry. The one fault is its green tip. A large number of varieties have been grown and tested here, but all discarded, but the two named appear to be the two best commercial varieties. But growers must understand that there is no fruit that varies so much and acts so differently on different soils as the strawberry. Brandywine does not do so well on light sandy soils as on clay or clay loamy soils, and on the other hand, the Williams does splendidly on light or loamy soils. Every grower must consider his location and nature of the soil.

Raspberries.

The raspberry crop last season was good and the demand was equal to the supply. Only three varieties of the raspberries are grown at the station now, all other varieties being discarded as not worthy of cultivation. The varieties grown are Marlboro, Herbert, Cuthbert, given in order of ripening. Herbert is still keeping up its reputation for the heaviest yielder, and the Cuthbert still maintains its place as first in quality. Marlboro is a good early berry, and has a place in the commercial plantation. Those are three

A 10-acre strawberry field ready for the pickers.

excellent varieties for either home or distant markets. Two varieties of black caps are grown, Conrath and Hilborn. Conrath is a strong vigorous grower, fruit large, quality good, early. Hilborn is a very hardy vigorous and healthy fruit, large, quality good, late, the best for northern districts.

A new plantation was put out last spring. The rows run north and south and are 40 rods long and six feet apart. They are grown like a hedge, the rows about two feet wide. By this plan we are able to get the best yield and a high grade of fruit. Stable manure is used as a fertilizer. The fruit is picked every other day and is marketed when fresh. Pruning is usually done in the spring by cutting out the old canes and thinning out the new one if too thick, and cutting back all canes to good strong buds. The young canes of the black caps are pinched back when about two feet high, and all laterals cut back in the spring to about 18 to 24 inches. Frequent and shallow cultivation is practised. This is necessary to maintain the soil moisture which is so necessary in the growing of small or bush fruits.

Currants.

The currant crop at the station was first-class this season. Nearly all varieties did well. There are about 30 or 35 varieties grown. Sixteen varieties of Dr. Saunders were furnished me last spring by Mr. Macoun, of the Dominion Experimental Farm, Ottawa. The currants are grown in the young apple orchard between the rows of trees. Plenty of stable manure is used to fertilize the currants and apple trees. Shallow and frequent cultivation is carried on throughout the growing season. The pruning is done by removing a number of the old canes, leaving as many of the strong young canes to take their place each year, thinning out all weak canes, and if growth is very vigorous some heading back will be found to pay. The varieties that are giving best results are:—Red Cross, bush vigorous and hardy, fruit large to very large, color red, quality first-class. Fays, bush strong and spreading, fruit large, quality good, red. Prince Albert, bush strong and vigorous, healthy and hardy, fruit large with good quality, red, a good late variety. Wilder and Perfection are also doing well. Raby-Castle is a heavy cropper, but the berry is small. There is not much demand for white currants. Grape and Imperial are the best varieties. Among the blacks Champion is one of the best, bush strong, vigorous, healthy and hardy, fruit large and of good quality. A heavy yielder. Naples an old standard variety, strong vigorous grower, healthy and hardy, fruit large and good quality. A number of other varieties have done very well, but the two mentioned are the best. Currants are not used in this country as much as they deserve. They are one of our best fruits.

Gooseberries.

There are nine varieties of gooseberries under test at the station, Champion, Crown Bob, Downing, Golden Prolific, Industry, Pearl, Red Jacket, Keepsake, Whitesmith. The American varieties have given the best results, owing chiefly to them being free from mildew; Pearl and Downing are the two best varieties, and there is scarcely any difference between them. Pearl carries a little more foliage than Downing, which is an advantage, as it protects the fruit from the hot sun, and in that way prevents the fruit from scalding. The crop this season was equal to last year with good quality. Pearl and Downing are about equal in every way. Red Jacket is also a good berry, but the bush is rather spreading, and inclined to lay on the ground. The English varieties are so subject to the mildew that they have not been

very profitable, but if the lime sulphur mixture will prevent the mildew as it is claimed to do, we will be able to grow the English varieties again. This remedy will be tested next season. Gooseberries delight in a cool, moist soil. Clay loam gives good results, well fertilized with stable manure. The bush should be kept thinned out by cutting out the old wood, and allowing new wood to take its place, and just before blooming, spray with Bordeaux with four ounces of Paris green to the barrel. This will destroy the currant or gooseberry worm, also keep the bush healthy. The fruit should be picked when fully grown, but not ripe, unless they are for home use. The average yield of the plantation for a number of years has been about five quarts per bush. Cultivation should be frequent, but shallow, so as to retain the soil moisture. This is very necessary in the growing of gooseberries and all fruits. If a few bushes are grown in the garden, a heavy mulch around the bushes will answer the purpose very well.

Cherries.

The cherry crop at the station was good this season, and the quality was first-class and sold for fair prices. The number of varieties has been greatly reduced the last two or three years, owing chiefly to the varieties being tender or undesirable sorts. These have been replaced by other varieties. The Yellow Spanish gave a very heavy yield of fine fruit and good quality this season, but could not recommend it for general planting as it is not reliable. Early Richmond was well loaded, but the birds usually take the bulk of the crop. Montmorency, the best of the Morello class, gave large yields of good quality. The tree is hardy and vigorous. English Morello has also been a profitable variety and annual bearer, a little slow in making a good orchard tree and I am afraid will not prove to be a long-lived tree. Fruit large, dark red, or nearly black when fully ripe; a good cooking cherry. Ostheim, of the Morello class, tree hardy, fruit rather small, color black, sweet, quality good, not profitable. Empress Eugene, Duke class, tree hardy, but a shy bearer, not profitable. Downers' Late, tree hardy, fruit small, red, sweet, not profitable. Of the twenty-five varieties tested here, the following three varieties are the best for the commercial orchard, Early Richmond, Montmorency, English Morello, given in order of ripening, and Montmorency is the best of the three. One hundred trees of this variety will be planted at the station next spring. The cherry orchard is given frequent and shallow cultivation throughout the growing season. For controlling the rot and black-knot on the cherries, the trees are sprayed before the buds swell in the spring with either 60 lbs. of fresh lime, 20 lbs. of copper sulphate (bluestone) to 200 gallons of water or 2 lbs. of copper sulphate to 50 gallons or one barrel of water. Just before the buds are open spray with the Bordeaux mixture and again when the cherries are about the size of peas.

Plums.

In plums we have about 45 named varieties, and 20 seedlings just coming into bearing. Quite a number of trees and varieties were damaged by frost during the cold winters a few years ago. These trees and the undesirable sorts are being replaced by either new or the same varieties. The crop this season was fine, quality good, very little rot. The Japanese varieties have all failed but the Burbank, and it is the only one of this class of plums that I would plant. It is a good cropper, fruit medium to large, quality very good for canning, and a good shipper. Among the European varieties that have done best here are Bradshaw, Purple Egg, Yellow Egg,

Imperial Gage, Field, Shipper's Pride, Gueii, Quackenbos, Monarch, Grand Duke, Lombard, Englebert, Pond's Seedling, and many other varieties have proved to be quite satisfactory. For controlling the black-knot and rot the plums are sprayed at the same time and with same mixture as the cherries. There are quite a number of varieties recently planted that have not come into bearing yet.

Pears.

There were about thirty-five varieties of pears planted at the station for experimental purposes, with a number of Keiffers for top-working other varieties on, to discover if some of the slow poor growers but good varieties could be improved in this way. None of this work has been so disappointing and discouraging as the pears. The eleven varieties of French pear planted in 1900 have been very subject to the pear or fire blight, and this season it was extremely bad, in fact, it has entirely wiped out the French varieties. Nearly all varieties have suffered more or less with the blight this season. Over thirty trees will have to be replaced this next spring. Unless some remedy can be discovered for this disease pear growing will have to be abandoned. The Keiffer stock has not proved to be a great success for working other sorts on as expected. They grow for about two years then the stalk dies. I cannot give any reason why, but more experiments will be conducted along this and other lines, both in grafting and the management of the soil.

Apples.

The apple crop this year was not large. The old orchard at the station did very well considering the yield for the past five or six years. There are only about 225 trees in the orchard, and about half are Golden Russets. The pick in 1906 was about 800 barrels: in 1907, 500 barrels, and this season a little better than 300 barrels. At blooming time the promise was for a bumper crop. I never saw a better bloom, but for some reason the fruit did not set, although the weather conditions seemed to be favorable for fertilization at the time. The early apples were a fair crop, and the quality of early and late apples was very good, but weather conditions at time of ripening was not favorable for imparting keeping qualities to the fruit. In the experimental orchard there were about thirty varieties, but there was very little fruit this season. There are quite a number of varieties that have not fruited yet, but so far, there is nothing equal to our old standard sorts. Some of the undesirable varieties are being top-grafted over to new or better sorts. I also find a number of trees not true to name, but Canada Baldwin, which promised to be of some value is showing weakness; also Wine Sap. The Yellow Transparent is of no value except for home use or nearby market. Bismark at one time gave promise of being a commercial apple, but after a few years test it has proved to be of little value. Tree very subject to twig blight. What we want is an apple equal to the Spy in quality, but a better shipper, and a tree that will come into bearing at an earlier date. This is work for the experiment stations. There is a greater demand for the Spy now than ever before. In fact, the supply is nowhere near the demand. The apple is the king of fruits; therefore, more attention should be paid to the improvement and cultivation of the apple than other fruits. About sixty-five varieties of apples are now grown at this station.

ST. LAWRENCE FRUIT STATION.

By Harold Jones, Maitland.

Character of the Season.

The winter of 1907-8 was much colder than the one preceeding, with a great depth of snow, but no frost in the ground. The first snowfall to remain on the ground fell on November 29, stopping plowing at that date. The snow increased in depth steadily until it reached a total of over 3 feet by February 9th. The coldest week of the season, February 3-9, was much below normal, the thermometer dropping to 36 below on February 5th.

April was cool with some heavy showers, fruit buds remaining dormant.

May was favorable, which advanced vegetation. Americana plums were in bloom May 20th. Fameuse apples in full bloom May 26th. Apple trees came through without injury except to some tender varieties. Cherries suffered to same extent, but gave a fair crop. Americana plums were uninjured, but Europeans suffered. Strawberries wintered well and gave a good yield.

Insects.

Insects were not numerous, and were easily kept under control by proper spraying. There was not two per cent. of codling moth in well sprayed orchards, although they did damage where not sprayed. Spot fungi was kept well under control by three sprayings, but in many unsprayed orchards both fruit and foliage were badly affected.

Sprayed orchards gave as high as 95 to 98 per cent. clean fruit, while unsprayed orchards gave as little as 20 per cent. clean fruit.

Cultivation.

Actual results have proved that it pays to cultivate our orchards, but the heavy losses we sustained about four years ago, brought the problem that confronts us: in how far dare we go in this matter of cultivation and save our trees from winter injury in the colder sections of Ontario. For years we have been told by successful fruit growers living in Western Ontario and New York State to give clean cultivation up to the first of August and then sow a cover crop, but we have found out by sad experience that such a practice leaves our trees in a quite sappy condition when winter sets in.

Since the freeze of 1903 it has made some of us think seriously of this matter of cultivation.

A few of the things noticed in the spring of 1904 were:—

1st. That young orchards not in bearing came through the winter in fair condition.

2nd. That trees heavily loaded the previous year suffered most.

3rd. That orchards in sod came through the winter better than those under cultivation.

4th. That trees in sod did not bear as heavily nor had as large fruit as those under cultivation.

5th. That young trees planted in sod do not flourish, but remain stunted and sickly, which leaves them subject to disease and the ravages of insects, particularly bark lice.

These observations lead us up to the question how to best treat our orchards so as to overcome the objectionable features of a tough sod and still have our trees with well ripened wood when winter sets in.

Since 1904 I have been preaching a modified system of cultivation in my bearing orchards that is giving very satisfactory results in well ripened wood and well colored fruit of large size.

To outline this system, I may say that instead of continuing clean cultivation until the middle of July or the first of August, as formerly, I plough as early in the spring as possible, and about the 20th or 25th of May I harrow the ground level and sow to some cover crop either red clover or oats, as I find the fertility and the condition of the soil warrants. This leaves the ground in a level condition for the mower which is used at intervals during the summer to check any weeds or tufts of grass that are bound to appear during the season. The last cutting is made just before picking. If oats are clipped during the summer in this way they will remain quite green until fall.

I find this system gives me an early, vigorous growth both in the wood and fruit buds, and the cover crop sown in this way does not draw any appreciable amount of water from the soil until the later half of the summer.

When cutting, allow the material to lie where it falls as it all aids in supplying humus for the year following and retards evaporation by wind and sun during hot, dry periods. We have got a much shorter growing and ripening season than our neighbors to the west of us and I find the system outlined above will give the early vigorous growth that is necessary, followed by conditions very similar to sod during the ripening season.

Fertilizing and barn yard manure every two or three years spread at the rate of 10 to 12 loads to the acre during the late fall or winter with an annual spring application of about 100 pounds muriate of potash keeps the soil up to a high standard of fertility and also in a good mechanical condition.

Six years ago I started a young orchard with the object in view of keeping the trees in a healthy, vigorous condition and at the same time harvest a crop from the land waiting for the trees to come into bearing. The year I planted the trees I prepared the land thoroughly, manuring with 12 cart loads to the acre and 2,000 pounds of muriate of potash; I then planted to potatoes, which I did not dig until all danger of starting late growth in the trees had passed. That fall I spread manure around the trees at the rate of one load to 10 trees for a cover crop. The next spring I plowed and planted corn which was cultivated until July 4th, when clover was sown in the corn, and then given a shallow cultivation. The third year I cut and harvested a full crop of clover about July 1st, and allowed the second growth to remain on the land, which gave a heavy cover. The fourth spring I plowed down the clover, planted to potatoes, and followed the same rotation to the sixth year. I find this system has given me six profitable crops and has left the trees in a vigorous, healthy condition, with fruit buds showing for next year.

The results of this experiment should be of value to the dairyman of Eastern Ontario, who realize the value of fruit on the farm, but hesitate in planting because they feel they cannot give up perhaps one of their best fields and wait 8 or 10 years for returns in fruit, with no profit or returns from the land in the meantime.

Apples.

My notes on varieties published in the reports 1904 to 1907 are in the main correct, but there will be some slight changes made in this report owing to a better acquaintance with some varieties and the greater age of the trees.

American Pippin: Top-graft, 1898, a moderate grower, subject to attacks by aphis on the foliage, an early, prolific bearer of fruit of no special value to this section.

Blunt: Planted in 1897, replanted in 1907, is a sound, compact, vigorous tree; hardy; this year the tree showed signs of weakness, and will probably die before it shows its bearing qualities.

Clayton: Planted 1897, a weak to moderate grower, came into full leaf and bloom in the spring and died of twig blight. The blight attacked the blossom first, and then spread through the trees, similar to pear blight.

Canada Baldwin: Planted 1896, a very tall, upright tree, vigorous and prolific. The fruit is attractive in appearance, but low in quality.

Milwaukee Apple in Bearing on Farm of Harold Jones, Maitland.

Gano: Planted in 1900; tree and fruit similar to Ben Davis; an early bearer, but showing signs of early decay. Evidently not hardy enough for this section.

Parling Beauty: Planted 1898; an upright, vigorous, healthy tree; fruit large and well colored; quality medium, may be of some value.

Trenton: Top grafted 1902; bore a few specimens for the first this year. May prove of value in this section as an early apple, as the wood seems hardy, and the tree vigorous and healthy.

Windsor Chief: Lacks vigor and productiveness and does not prove to be hardy here, as it has suffered to same extent every winter, but has not been killed out.

Winter St. Lawrence: Planted 1896, came into bearing 1907, and has given two light crops. Tree healthy, vigorous and apparently very hardy; fruit of good size and attractive color, showing up well in the packages. If its bearing qualities improve it should be a desirable apple; season December.

Milwaukee: On root graft, planted in 1896, has been giving annual crops since 1900 and proving a profitable tree to plant when there is a market for a cooking apple.

I have now Milwaukee fruiting as top-grafts on McMahon, Hibernal, Gideon, Longfield and Pewaukee. McMahon and Hibernal are proving very desirable stocks, the Milwaukee tops being strong, vigorous and healthy, producing full grown fruit. On *Gideon* the top is out-growing the stock and the fruit is undersized and inclined to overbear and shows some weakness in foliage.

On Longfield the results are not so satisfactory; the tops made vigorous growth for a few years, but this year there is a lack of vigor, and one tree died outright.

On Pewaukee the results are fairly good, but not equal to McMahon or Hibernal.

Pears.

Of the 40 varieties of pears planted at intervals since 1896, they are practically all dead except Flemish, Bessimianka, Victoria, and Ritson. Flemish does fairly well in sod and gives a light crop annually, but under high cultivation, it suffers in twig and bud every year and dies at an early age. Bessimianka and Victoria are worthless Russian varieties. Ritson is fairly hardy in wood, but not as hardy as Flemish in fruit bud.

Plums.

All the European plums are dead except Glass Seedling, Raynes, Mount Royal, and Lunn. Glass Seedling was planted 1897 and gave a few fruits this season for the first. The tree is healthy and vigorous, but first buds are evidently tender. Raynes and Mount Royal are perfectly hardy so far, and are just coming into bearing. Lunn is only one year planted.

The Americana plums planted in 1896 to 1898 were not true to name and proved in some cases to be wild thorns. I have planted this year 28 trees, one or two of a variety, which are all doing well, and possibly something will result from this planting that will prove valuable for this section.

Varieties planted in 1908: 4 Aitkin, 2 Odegard, 2 Golden Queen, 2 Bixby, 2 Cheney, 2 Mankato, 1 Swift, 2 Admiral Schley, 2 Smith, 2 Hawkeye, 2 Howard's Yellow, 2 Ocheda, 3 Lunn.

Cherries.

The cherry crop was fair, much better than was expected following the low temperature of the preceeding winter.

Orel produced about two-thirds of a crop, but the fruit was not quite up to its usual size, and not so good in quality as in preceeding years.

Montmorency gave one-half a crop, normal in size and quality. This cherry seems the best of any fruiting yet, but is not quite as hardy as Orel and E. Morello.

English Morello gave two-thirds crop, size and quality, a little below normal.

Early Richmond did not fruit with me this year.

Ostheim, a hardy, vigorous tree, but a very shy bearer. It sets an abundance of buds, but they are mostly injured during winter. Fruit too small to be of any value where Montmorency and English Morello will grow.

Vladimir, a worthless variety, but hardy.

Dyehouse, Gorwood, May Duke, Black Knight, Olivet, Reine Hortense, all varieties tender here, and die the second or third year from planting.

Strawberries.

My strawberry tests have been conducted on a loam soil, inclined to clay loam. The results obtained so far show Wm. Belt, Williams, Woolverton, Climax, Saunders and Miller to be very desirable varieties that can be planted with profit here.

Wm. Belt and Climax both catch the market on sight and they give good crops.

Gooseberries.

Golden Prolific produces a heavy crop of extra large fruit of good quality and is the best variety tested yet.

Downing stands second to Golden Prolific, a good old standard. Both varieties are free from mildew and are sure fruiters. The best varieties tested yet.

Raspberries.

I have tested six varieties of raspberries, and I have not found any of them except Herbert hardy enough to withstand the winters here without some protection. Herbert has proved perfectly hardy so far and gives every promise of being a variety that can be planted with profit here.

Fruit Growers' Homes:
A Model Cement Residence in the Leamington District.

REPORT OF ALGOMA FRUIT EXPERIMENT STATION, 1908.

By Chas. Young, Richard's Landing.

In submitting my report for 1908, I have little to report regarding the work here, as my attention has been largely directed in planting well known hardy winter varieties such as Hibernal and hybrids with a view to top-grafting in the coming spring of 1909. Notwithstanding the unfavorable spring, succeeded by a very dry summer, these have all done well, and here I may note that about half of them planted in similar ground, but heavily mulched with long strawy manure, have made a much better growth than those on bare ground given clean cultivation with a dust mulch during the summer. This may be acounted for by the exceeding dryness of the season. I would not like to recommend this practice of keeping the ground covered around the trees longer than the first or second year after planting with manure. I find it induces a long, sappy growth of top not matured. When winter sets in it has a tendency in keeping the roots too near the surface of the ground, which is not advisable if clean cultivation is to be kept up or if a very dry season like the past should occur.

All the fruit trees have ripened well, and have gone into the winter in good condition. Some which bore heavily in 1907 have shown signs of weakness, and oyster-shell bark louse is on the increase very noticeably. This I can see wants particularly to be attended to in the near future. Next to sunscald, it is the principal difficulty to be attended to. Scab, we are not much troubled with; curculio or codling worm is scarcely in evidence; but the bark louse is everywhere and on the increase. As spraying machines are not much used here yet, it is rather a difficult matter to get at the louse if left for a few years, and it gets up into the fine branches. But it has to be done, as it is a matter of killing the louse or the louse killing the trees.

I have had little experience in whitewash treatment, but believe it is good in the summer. I have found nothing cheaper or more effectual than good, strong tobacco water sprayed on early in the season when they make their first appearance about the beginning of June. The black aphis which attacks the cherry I find harder to kill.

A word of caution to those who may chance to come across a cure for the apple aphis as given in an agricultural paper by an expert. It reads: "A very fine spray on a bright, sunny day with pure coal oil." Well, this will certainly kill the aphis, but it may kill the tree too. With a little care sunscald is now easily controlled or prevented. Here in the north it is necessary to protect the trunk and lower portion of the top before winter. The best prevention I have found to be building paper, not tar-paper, wound around the trunk and the lower part of the top, secured by tying with a cord. After the tree gets its rough bark, there is little danger from sunscald. A good thick coat of whitewash in the fall is nearly as effective and easily put on.

These are the two principal difficulties we have to contend with and the remedy for both is simple and sure, and yet we find that in nine cases out of ten it is neglected. It is not hard to find a reason. Most of us in our young days came from Old Ontario when Kings and Spys were our best apples. So we planted them here. They all died. We planted again, but in the meantime had learned something, so did not confine ourselves to those two

winter varieties, but mixed them up with Transparent, Duchess, Wealthy, and a very liberal sprinkling of crabs. We did not take very good care of them, as the little orchard was near the house and served another purpose. It was handy to pen the young calves in, fruit growing being only a side line, anyway.

We saved a few of the second planting, mostly Duchess and crabs. About this time, the tree agent put in his appearance with his high class novelty. Mostly everyone bought and planted a few, but there was nothing big about them excepting the price. They all died. By this time, the average farm had about eight or ten trees, mostly crabs. A few men not easily discouraged kept on planting, taking fairly good care of the trees and found they were getting from two to four barrels of apples from those first planted trees which were sold off the tree at 25c to 35c a pail of 10 quarts. Now, present conditions are that those who planted and took reasonably good care of their orchards are making more money from the three or four acres than they do from the rest of the farm. This is from fall apples. Winter fruit, so far, I may say, has been a failure. We have nothing that will keep longer than Wealthy;—that is, that will sell in the markets. With eastern growers of fruit that is not so great a grievance as would appear. Our northern grown fruit has much better keeping qualities than that grown to the south of us. Wealthy will keep until March, Alexander I have kept until the end of February. This year, for some reason, the keeping qualities are not so good. Still, locally, we can sell our fall apples for 50 cents a barrel more than can be obtained for eastern fruit. Our fruit is firmer and keeps longer.

The question is sometimes asked, will fruit growing ever be a success commercially in Algoma? I can answer this best by pointing out several orchards planted on suitable ground, and that have been given fairly good attention, that bring their owners more money every year for fruit sold from first of September up to Christmas by 25 per cent. at least than is usually obtained on a similar piece of land in the best apple districts of Ontario. I have been very careful in obtaining this information. Of course, we save something on freight, on the other hand an apple tree grown in the north will not live as long or grow to the size that it will farther south.

There are a few conditions necessary to observe in order to insure success. They are: Avoid planting on the stiff, red clay common in Algoma, if possible. If this cannot be done, first ridge up the land with at least two plowings and plant on the top of the ridge, say 25 feet apart. That is none too close. Plant low headed trees from the top, say two feet from the ground, for ordinary winters. Some of spreading habit, such as Longfield, may be of the usual height as sent out from the nursery. From the head as close to the trunk as possible, give clean cultivation until the tree comes well into bearing and do not prune quite so close as it is usual in the south. We do not go heavy into winter fruit until we find something better suited to our climate. We are on the road to success in this respect with such varieties as Milwaukee, Boiken, Patten Greening, but they are not fully tested here yet. Select a location just a little elevated with a north or north-western exposure, and last but not least, a windbreak, not on the north, but on the south, although it is desirable on both sides; but not too close,—allow plenty of room for air to circulate. For several years I have paid attention, and have made inquiry, in regard to giving clean cultivation after the trees came into bearing, and have no hesitation in saying that for the ordinary farmer

who has an acre in fruit it is not necessary. I would recommend seeding down with red clover, to be cut and left on the ground, or the old sow and her pigs may be turned in. This will hold out for perhaps six years when June grass will begin to take the place of clover, when the ground may be well disked up and seeded down again.

This may not be sound advice for one making a speciality in fruit or whose orchard gets his attention first, but for the average farmer with his fifty or a hundred trees who has other work to attend to in our short springs, I think it will be found preferable. In my own case I have about two acres that have always been kept clean with the cultivator and the plow, and the percentage of loss has always been much heavier than on that part in grass, chiefly on acount of the wood not ripening in the fall, and root killing along with the damage likely to occur in the chafing of the trunk by the whiffletrees.

This part of Algoma, St. Joseph Island, is gaining a reputation for fruit growing, not from any particular advantage in soil or climate, but from the fact that many of us refused to believe the often repeated assertion that we are too far north to grow fruit. I have it from the best authority that the money value of fruit shipped from the port now considerably exceeds that of any other commodity raised on the farm.

Apples.

Of fall apples we have quite enough, and unless something extra good turns up, there is no need in increasing the numbers. Among winter apples, not extensively planted yet, but which promise well and have fruited, are Pewaukee, Winter St. Lawrence, Baxter, Peter, and improved Wealthy. Others extensively planted, but not yet fruited, Milwaukee, North-west Greening, Peerless, Ontario. This last I have fruited, but the winter of 1903 and 1904 pretty well killed them out. Among the undesirable kinds which have been recommended and tried are Ben Davis, which is entirely out of its climate here, a poor, dirty colored apple and worthless to eat. Scott's Winter has been extensively planted, but has not been satisfactory. Fair sized fruit may be obtained from young trees, but it seems too small to take the market, and is disappointing when you come to pick and barrel. The tree is not quite hardy and the fruit in an ordinary house cellar is apt to shrivel up during the winter.

Pears.

Although fairly good specimens may be met with grown under favorable circumstances, they had better be left alone. I have never succeeded in getting a remunerative crop. Russian pears seem to be quite hardy, but the fruit is very poor. Of other kinds, Flemish Beauty is perhaps as hardy as any.

Plums.

Several years ago if any one had asked me what plums to plant, I would have said, plant Japans; now, I would advise to let them alone. They made a remarkably fine growth for some years after planting, but no fruit. They were budded on the Peach, which is, I think, a mistake, at any rate for our

climate. Among all the varieties I have tried, there is only one of the domestic class that is perfectly hardy, Glass Seedling. Lombard is a good second, but is inclined to overbear. Next year quite likely the tree will be dead. Americanas have given much better satisfaction, but the color of the fruit does not take in the market. Still, the quality when preserved is fairly good. Most of them I planted were on peach stock, and are dying out. A few planted out three years ago (Russians) had a few plums last year, the trees so far are hardy and the fruit good. They are very promising.

Cherries.

Cherries have always done well here, or anywhere near the influence of the water. Further back on the mainland, they are not a success, they blossom but form no fruit or if fruit does form it drops off prematurely. I have never missed a crop here. For those going into a quantity for market, Early Richmond, Montmorency, and English Morello will fill the list. Montmorency is the best of the three, but it will take them all to lengthen out the season. Ostheim is a very good cherry to eat out of the hand when fully ripe, but not so profitable as the others.

Grapes.

Grapes may be grown for home use, but we cannot compete with Southern Ontario either in quantity or quality. Janesville I have found the most satisfactory.

Strawberries.

Strawberries have without doubt been the best paying fruit crop here. The climate seems just to suit all small fruit except blackberries. We have some 35 varieties of strawberries under test here, but soil moisture, and cultivation make such a difference that I do not care to recommend any one variety as the best. Some, as the Haverland, are very susceptible to dry weather, while Bubach or Glen Mary do not suffer so much. The Williams and Saunders I discarded years ago on account of their green tips and being no better otherwise. Yet these two are favorable berries with many. Clyde, which did poorly in 1906 and 1907, got back this year to its old place as a No. 1 berry; Splendid, Bubach, Glen Mary are all good. I plant in rows four feet apart and two feet in the row. Formerly I used to take only one crop, but latterly take two, as some varieties give a larger yield the second year. We do not cover in winter as it is not necessary here on account of the snow.

Currants and Gooseberries.

These always do well. In black currant, Champion and Saunders are among the best; Versailles and Fay's Prolific among the red.

For the second year in succession the English gooseberries have out done the Americans as a class. The very best yields here from Red Jacket and Golden Prolific.

The local demand has never been nearly filled with currants and gooseberries. Keeping the old wood cut out, along with plenty of cow manure, clean cultivation, meet all requirements.

Raspberries.

Raspberries are not in much demand, the wild fruit is plentiful, and by many preferred to the cultivated. Loudon, with me, is the best to yield. When we get a crop of Cuthberts they are certainly better, but this variety is tender and not to be depended on. Blackcaps I have given up growing. They were not a success. Brinkler's Orange is a favorite for quality, but the canes are not healthy. Herbert I have not tried yet.

Fruit Growers' Homes:
A Neat Residence in the Burlington District.

VEGETABLE STATION.

By E. E. Adams, Leamington.

This season has been a very favorable one for forcing vegetables, tomatoes, cabbage, peppers, melons, and cucumbers being splendid crops. Tomatoes were planted in the field about the 24th of May, and the first pickings were made on June 20th, but good picking did not commence until July 1st, and the early crop was all off by August 11th on my land. The growing season was all that could be desired, plants having made a heavy growth by June 20th, and those plants having been given a small quantity of nitrate of soda (100 pounds to the acre) gave fruit very early, and the bulk of the crop ripened up quickly and in season when prices were at their best. I have been using soda for several years, and from results obtained, I am of the opinion that one application of 100 pounds to the acre, scattered around the plants in small quantity, as soon after planting as possible, and worked in either with the hoe or fine-toothed cultivator at once, with good culture following, will produce a much larger quantity of earlier ripened fruit than where not used. I have tested the use of two applications of soda in a sea-

son, the last being applied about ten days after the first, but found such method to produce more vine, and not any more fruit, and with a tendency to delay ripening.

Early cabbage did not turn out this season quite as well as usual on account of a dry spell just at heading time. The usual applications of soda were used, but owing to too little moisture, the results were not as marked as in seasons when there is plenty of rain at the right time. Musk melons were perhaps the largest crop ever grown here. There was very little blight. No doubt the dry weather in August helped to keep it down. We find blight very bad in seasons where there is plenty of rain or heavy dews during time of ripening. Spraying for the blight did not appear to produce any marked results, as those unsprayed were as good vines as those sprayed. The spraying material used was three pounds of sulphate of copper, 5 pounds stone lime, and 40 gallons of water, applied when plants were set in the field, followed again in about two weeks, and again in two weeks; the one application of ammoniacal carbonate of copper at the end of the following two weeks. Paris Green was added to the first application (three ounces to 40 gallons) to kill the striped beetle. This was the quickest way to finish this pest.

The market demand appears to be in Ontario for green fleshed melons, although there is a growing demand for something better. This season the Paul Rose, Burrell Gem, and Fordhook, all salmon fleshed varieties, were in splendid demand. The Burrell Gem is one of the finest melons, if not the finest quality grown, and can be shipped across the continent and arrive in good condition. They have been shipped from their home in Colorado to New York by freight without refrigeration, which certainly speaks well for them. Some were sent to Brandon from here this season by express in baskets, and arrived in first-class condition, and they were ripe when picked. The one trouble with this melon is that it will split at the blossom end if too wet when ripening.

Early potatoes were a small crop, those on sandy soil being very light, while on lower soil they were much better.

The tomatoes tested this season, along with those tested again from last season's list, were Burpee's Earliest Pink, Stirling Castle, Frogmore, Select, Wealthy, Bonny Best, Jack Rose and Acme, Among these, the Wealthy is decidedly the best and most profitable to grow for a crop, not alone as to quality, but as to quantity. It cannot be called an extra early, but for a mid-season crop it cannot well be equalled. For canning purposes it is desirable as to quality, being sweet, and fairly solid, much better than Earliana for that purpose. The Earliana still holds supremacy as the earliest cropper here, not only for earliness, but for productiveness. The Maule's Earliest of All is also a good cropper, but is a little later than Earliana, and of very fair quality for an early tomato. Rennie's First of All is also quite satisfactory. Stirling Castle is of no market value whatever for this district, nor in fact for any other shipping district, but would be a nice small tomato for selling on large markets in quart berry boxes from market gardeners' stalls. It is too small for basket use, but is smooth and of good quality. Frogmore Select is a fair tomato, but is of no value as a shipper. It may be satisfactory under glass for a certain season, but it cannot be recommended for outdoor culture. Earliest Pink is a good cropper, but is not as smooth as the Red varieties, and is somewhat soft. Bonny Best is a very fine looking tomato, being of good size, smooth as an apple, but too soft for a shipper. Jack Rose is considered a very early, and productive variety, but from its showing this year it is of no value for quality or market or as a shipper. Success is a very nice tomato, but far too soft on our soil

to be of any value either early or late. The quality for home use is satisfactory. Acme is not profitable on our soil, which is sandy. In fact, very few of the pink or purple varieties are of any use here. The only one that pays well is the Plentiful, which is a good cropper, and of the finest quality, and a very good shipper.

Some work was done with potatoes. These were spread in a room where they had good light and sprouts allowed to grow to about an inch in length and were planted on sandy loam May 25th and dug on September 30th. One-half were cut and the balance planted whole. The table below shows the resulting crop in pounds. The Bovee and Burpee's Extra Early gave the larger crops. The whole potatoes ripened a little ahead of the cut. Medium sized potatoes were used in all cases. A dry spell overtook these in August, and they did not turn out as well as expected. Fifteen pounds to each variety were planted; one-half being cut; one-half being whole.

——	Quantity from cut potatoes when dug.	Quantity from whole potatoes	Per cent. of small potatoes.	Marketable Potatoes.	Quality when cooked.
Early Ohio	26½	22	10	90%	Fair
Burpee's Extra Early	28	23	12	88	Good
Triumph	18	13	15	85	Fair
Bovee	27	24	10	90	Good
Norton Beauty	16	13	15	85	Fair
Irish Cobbler	17½	11½	17	83	Fair
Extra Early Eureka	15¼	12½	16	84	Fair

Sweet Potatoes Tested in 1908.

Sweet potatoes turned out splendid. The specimens were very fine, and where the season is warm enough they can be grown quite as well as in Southern States, and fully as good in flavor and quality.

Vineland Bush: Short and chunky grower; quality good.

Jersey Sweet: Rather longer in growth than Vineland Bush; good quality.

Yellow Mansemond: Medium size; good quality.

The last two mentioned are best croppers.

EXTENT OF THE VEGETABLE INDUSTRY IN THE LEAMINGTON DISTRICT.

(Special Report by A. McMeans, O.A.C., Guelph.

The following was shipped from Leamington during the season of 1908:

	Express, %	Freight, %		Express, %	Freight, %
Tomatoes, 32,000 11-quart baskets	75	25	Melons, 750 11-quart baskets	95	5
Peppers, 1,000 11-quart baskets	95	5	Melons, 8,500 crates or bushel baskets	85	15
Cucumbers, 1,900 11-quart baskets	90	10	Cabbage, 2,100 crates	50	50
Beans, 800 11-quart baskets	95	5	Cabbage, 2,000 bushel baskets	55	45
			Corn, 4,250 dozen	85	15

The above percentage of freight is approximate.

The following is about the approximate average prices received for the vegetables shipped:

Tomatoes	35 cents per basket.	Melons, Musk	$1.00 per crate or bushel basket.
Cucumbers	40 "	Cabbage	75c. per crate or bushel basket.
Peppers	25 "	Corn	About 11c. per doz.
Beans	25 "		
Melons, Musk	40c. per 11-qt. bskt.		

The following were used at the canning factory: Tomatoes, 60,000 bushels; beans, 20 tons.

The vegetable industry in this section will be much larger this year as H. J. Heinz Co., of Pittsburgh, are opening a Canadian branch at Leamington, and will have under contract 450 acres for the production of vegetable food products.

Ruthven shipments for 1908 were as follows:

Tomatoes, 8,000 11-quart baskets; melons, 185 11-quart baskets; melons, 360 crates or bushel baskets; cabbage, 280 bushel baskets; cabbage, 415 crates; cucumbers, 30 11-quart baskets; corn, 450 dozen. These were all shipped by express and prices will rule about the same as at Leamington.

Kingsville shipments (all by express) for 1908 were as follows:

Tomatoes	1,120 6⅔-quart baskets.	Melons	35 Crates.
"	2,980 11 "	Cabbage	105 " or bushel baskets.
Cucumbers	25 11 "		
Melons	785 Baskets.		

The canning factory here used 41,000 bushels of tomatoes.

The shipments from the above three places make a total as follows:

Tomatoes	6⅔-quart baskets	1,120 at	25c		$280 00
"	11 "	42,980 at	35c		15,043 00
Peppers	11 "	1,000 at	25c		250 00
Cucumbers	11 "	1,955 at	40c		782 00
Beans	11 "	800 at	25c		200 00
Melons	11 "	1,720 at	40c		688 00
"	Crates or bushels	8,895 at	1 00		8,895 00
Cabbage	"	4,900 at	75c		3,675 00
Corn	Dozen	4,700 at	11c		517 00
					$30,330 00

To which should be added 101,000 bushels of tomatoes supplied the two canning factories, also 20 tons of beans.

101,000 bushels tomatoes at 27½ cents per bushel, $27,775.00.

There was also shipped from Leamington 56 cars of onions, an average of 440 sacks of 75 pounds each per car, making a total of 24,640 sacks for which the growers received an average price of 65 cents per sack, $16,016.00.

Making a grand total for this district as follows:

Vegetables shipped by express or freight	$30,330 00
Vegetables supplied canning factory	27,775 00
Onions shipped	16,016 00
	$74,121 00

I might add that the average yield per acre of tomatoes supplied the canning factories was under 200 bushel per acre.

HORTICULTURAL EXPERIMENT STATION, JORDAN HARBOUR.

By H. S. Peart, B.S.A., Director.

In preparing this, my first annual report of the work at the Horticultural Experiment Station, I shall briefly mention some of the particulars leading up to the work of the present year.

On acquiring the property in 1906 a foreman was placed in charge and much preparatory work in cleaning up the land and the removing of unnecessary fences done, but no attempt was made at experimental work.

In the spring of 1907 most of the land was sown to oats, the balance being in sod and summerfallow. Soon after my appointment in June, the work of underdraining was started, following plans prepared by Mr. W. H. Day, of the Ontario Agricultural College and before winter a complete system of drainage with a total length of nearly eleven miles was laid. The land was fall plowed, worked and ribbed before winter and a considerable portion was treated with a dressing of manure preparatory to spring planting.

Cold Storage and Barn at Horticultural Station, Jordan Harbour.

At a meeting of the newly appointed Advisory Board held in Toronto in February, 1908, a draft of the proposed experimental work was submitted, revised and approved. The necessary stock and seed were ordered and plots laid out.

On the opening up of spring work, we found as a result of under draining, that instead of the land being several days to a week later than adjoining farms as in the past, that we were able to begin work a few days earlier than our neighbors, which gave us a good start in April.

The station grounds were subdivided by cross roads at convenient intervals for the purpose of affording the public and our laborers easy means of access to all parts of the work. In most cases these roads divided the different classes of soil almost completely so that the work of planting was greatly simplified.

In order that future plantings be kept as nearly as possible uniform with the present, all the blocks are arranged so that they can be extended in at least one direction.

It is the purpose of the station to test all classes of crops of interest to horticulturists in Ontario, paying special attention to the tender fruit districts and to co-operate with other experiment stations to generally further the results of all. With this object in view, a few varieties of known merits were planted as checks and new and less widely known sorts set for comparative testing.

FRUITS.

Apples.

While apple growing is not a leading industry in this immediate locality, the necessity of doing considerable work with that fruit is manifest on all sides. A portion of the clay loam land was set aside for testing new varieties, different kinds of stocks for top working, dwarf *vs.* standard and high *vs.* low heads. The following varieties were used for top-working Baxter, Ben Davis, Duchess, Haas, Hibernal, McMahon, Pewaukee, Red Siberian, Tolman Sweet. For high *vs.* low heads and dwarf *vs.* standard the following one year old standard and Doucin trees were used: Astrachan, Alexander, Blenheim, Baldwin, Cranberry, Duchess, Gravenstein, Greening, Hubbardston, King and Spy.

The following is a list of the varieties, old and new, set for testing purposes: Arctic, Astrachan, American Pippin, Alexander, American Golden Russet, Bank's Red Gravenstein, Belle de Boskop, Baldwin, Boiken, Blenheim, Ben Davis, Baxter, Black Twig, Barry, Ben Hur, Bjorkman, Bethel, Bismark, Cranberry, Chenango, Cornish Aromatic, Canada Red, Champion, Duchess of Oldenburg, Delicious, Early June, Fameuse, Gano, Gypsy Girl, Grimes' Golden, Greening, Gravenstein, Green's Baldwin, Garden Royal, Hibernal, Haas, Hurlburt, Hubbardston, Jefferies, King, Keswick, Krupneena, King David, Keswick Codling, Lowell, Mother, Milwaukee, McMahon, Mann, Mammoth, McIntosh Red, Muskoka Beauty, Magog Red Streak, New Delicious, North West Greening, Newton Pippin, Opalescent, Peerless, Primate, Pewaukee, Peasgood Nonsuch, Queen of the North, Russell, Rolfe, Rome Beauty, Rufus, Rhode Island Greening, Rosenhagen, Scarlet, Seek, Spy, St. Lawrence, Salome, Shiawassee, Sutton's Beauty, Stark, Winter Arabka, Wealthy, Winterstein, Wellington, Wismer's Dessert, Wagner, Winter Banana, Windsor Chief, Wolfe River, York Imperial.

Apricots.

While few people care to plant very many apricots, there are some few sections where they may be grown for profit. The following varieties were planted here for testing: Alexis, Gibb, J. L. Budd, Harris, Stella, Sheuse.

Currants.

The following varieties of currants were set to test their relative merits in this locality: Red and white—Chautauqua, Cherry, Diploma, Francis, German, Fay, Filler, London Market, Long Bunched Holland, North Star, Perfection, White Grape, Wilder. Black—Boskop Giant, Champion, Clipper, Eagle, Kerry, Lee, Magners, Success, Saunders, Victoria.

Cherries.

Among the cherries the following varieties were set in the test blocks. Sweet—Allen, Black Tartarian, Caroon, Chapman, Early Lamourie, Governor Wood, Ida, Knight's Early Black, Llewelling, Luelling, Napoleon, Ohio Beauty, Pickering, Pelham, Windsor. Sour—California Advance, Double Natte, Dyehouse, English Morello, Early Richmond, Empress Eugenie, Fouche Morello, Late Duke, Louis Phillipi, Leib, Lambert, Montmorency, Murdock Bigg, Ontario Preserving, Reine Hortense, Terry, Weir.

A block composed of the following varieties, Black Tartarian, Dyehouse, Early Richmond, English Morello, Governor Wood, Montmorency, Napoleon and Windsor, was set to test different methods of tillage and all were treated alike this year, the land being planted with melons.

Crab Apples.

The following list of crab apples was set this year: Florence, Hyslop, General Grant, Minnesota, Martha, Montreal Beauty, Muskoka Champion, Orange, Power's Large, Red Siberian, Transcendant, Van Wyck, and Yellow Siberian.

Grapes.

A small vineyard of the following varieties was set: Amina, Agawam, Brighton, Barry, Banner, Concord, Campbell's Early, Catawba, Champion, Charleton Eclipse, Francis B. Hayes, Green's Early, Green Mountain, Herbert, Hicks, Hermon Jaeger, Isabella, James, King, Lady, Moyer, McPike, Moore's Early, Massasoit, Niagara, Pierce, Regal, Sunrise, Vergennes, Worden, and White Sweetwater. Some of these have been tested and proved the most suitable for the Winona District, and others are newer and have not been tested in Ontario as yet.

A block of the following varieties: Concord, Campbell's Early, Niagara, Vergennes, and Worden was set to make rows illustrative of different methods of training and pruning and to compare the relative merits of each system.

Gooseberries.

Owing to the brisk revival of appreciation of this important fruit, we made special arrangements to get the leading varieties which have given satisfaction in Great Britain and United States, with the result that we have in our trial grounds the following varieties: Bright Venus, Berry's Early Kent, Carmen, Columbus, Crown Bob, Cheshire Lass, Drill, Downing, Early Sulphur, Early White, Glory of Ratcliff, Glenton Green, Green Walnut, Green Casoigne, Hedgehog, High Sheriff, Heart of Oak, Industry, Keepsake, Leader, Langley Green, May Duke, Mountain Seedling, Oregon Champion, Pitmaston Green Gage, Portage, Raspberry, Red Jacket, Smith's Improved, Victoria, Whitesmith, Winham's Industry, White Champagne, and Yellow Scotch.

Peaches.

Special emphasis was placed upon the testing of peaches. We have secured trees from several parts of Europe, United States, and Canada and have altogether 101 varieties under test as follows: Arkansas Traveller, Australian Saucer, Alton, Arp Beauty, Admiral Dewey, Arthur Chevreau,

Brigdon, Barnard's Early, Beer Smock, Belle of Georgia, Bowslaugh's Late, Bronson, Banner, Bilyer's Late, Bonanza, Belle Henri Peinud, Baltet, Billmeyer, Baron Dufour, Biquett Free, Bailey, Berenice, Crawford's Early, Crawford's Late, Captain Ede, Chair's Choice, Crothers, Cardindale, Conklin, Coonnetts, Elberta, E. Mamie Ross, Edgemont Beauty, Edouard Andre, Early York, Early Elberta, Globe, Golden Drop, Greensboro, Goring's Red, Grosse Mignonne Hative, Galande, Graves, Hooker, Hative Paullard, Holderbouir, Holderbaum, Heiley, Engol Mammoth, Kalamazoo, Krummel October, Keyport White, Lemon Free, Leamington, Longhurst, La France, Lockwood, Lewis Seedling, Large Early York, Lamont, Lee Angle, Lamon, McKay Late, Muir, Michigan Beauty, Marshall, May Lee Cling, New Prolific, Old Mixon, Opulent, Opoix, Oceana, Prolific, Pres. Lyon, Poole Favorite, Piequett's Late, Prof. Villiare, Pearces' Mammoth, Reeves' Favorite, Russel, Rouge de Maide Brigg, Ray, Smock, Smithson, Smith's Superb, Stump of the World, Salway, Strawberry, Surpasse Melocoton, Triumph, Townsend, Tenton de Venus, Wellington, Wolsey, Worth, William's Favorite, Washington, Walkers, Wheeler's Late, Yellow St. John, and Yellow Rareripe.

To still further this test, most of the varieties are duplicated on both sand and clay soil. Blocks of the following varieties: Admiral Dewey, Elberta, Engol Mammoth, New Prolific, Smock, and Yellow St. John have been set on both sand and clay to illustrate the different systems of heading and pruning and possibly different methods of soil treatment.

Pears.

A large importation of French and English pears was brought in to test beside our leading commercial sorts, so that our variety test is at present composed of the following varieties: Antonine, Delfoose, Anjou, Amile Baltet, Alexander III., Bartlett Seckel, Beurre Clairgeau, Beurre Gifford, Beurre Hardy, Beurre Rance, Beurre Bosc, Belle Renee, Bon Chretien Bonnamour, Beurre Capiaumont, Bartlett, Beurre de Naghin, Baltet Pere, Beurre d'Amanlis, Beurre Bachelier, Beurre Gifford, Bartlett, Beurre d' Anjou, Clapp's Favorite, Crosby's Hardy, Comte de Lamy, Clapp, Dempsey, Doyenne Boussock, Dana's Hovey, Doyenne d'Alencoz, Durondeau de la Forestrie, Doyenne Martin Clavier, Duchess, Delavilleaine, Doyenne de Juilett, Des Monnes, Doctor Joubert, Directeur Hardy, Duchess d'Angouleme, Emile d'Heyst, Easter Beurre, Eva Baltet, Frederick Clapp, Flemish Beauty, Fondante d'Antoinne, Fondante Thirriot, Fondante des Boise, Forelle, Goodale, Gan's Seedling, Hoosie, Howell, Japan Golden Russett, Jean de Arc, Josephine, Jargonelle, Keiffer, Koonce, King Karl, Louise Bonne, Lincoln Coreless, La de Jule Guinedon, Lyerlie, Lady Clapp, Marie Louise, Mme. Earnest Baltet, Mme. Baltet, Nouvelle Fulvie, Oliver des Serres, Pres. Druard, Pres. Barabe, Prof. Grosdemange, President Devolaine, Ritson, Roosevelt, Renfrew, Rutter, Sheldon, Souvenir, Superfine, Seckel, Thompson, Tyson, Virginia, Baltet, Vermount Beauty, Wilder, Worden, Seckel, and Winter Nelis.

A block of Bartlett, Beurre d'Anjou, Clapp's Favorite, Duchess d'Angouleme, Easter Beurre, and Flemish Beauty on both dwarf and standard stocks were set side by side to ascertain their relative merits. This should be of special interest to prospective pear planters.

Plums.

The following varieties of plums were set to illustrate their commercial value, and to be used for different methods of pruning and soil tillage,—Reine Claude, Gueii, Duane's Purple, Pond Seedling, Washington, General Hand, Lombard, and Yellow Egg.

The following varieties were set in the variety test: Apple, Archduke, Ancaster, America, Blue Prolific, Bleaker's Gage, Bartlett, Burbank, Bradshaw, Beauty of Naples, Canada Orleans, Chabot, Czar, Columbia, Climax, Clyman, Coe's Golden Drop, Cullin's Golden Gage, Duane's Purple, Diamond, Early Prolific, Early Rivers, Early Transparent, English Blue Damson, Emerald, Earliest of All, Field, Fellenburg, Formosa, French Damson, Gideon, Gueii, Giant Prune, General Hand, German Prune, German Damson, Gavotia, Grand Duke, Glass Seedling, Huling's Superb, Imperial Peach, Imperial Gage, Ickworth Imperatice, John A. Kirke's Plum, Klondyke, Kelsey, King of the Damson, Kingston, Lombard, Latchford, Lowry's Gage, Large Golden Prolific, Lucy Gray, Monarch, Moore's Arctic, Moyer, Mary, Mallard, Monroe, McLaughlin, Niagara, October Purple, Peter's Yellow Gage, Perry Oriental, Pond Seedling, Purple Egg, Prunus Simoni, Pearl, Quackenboss, Rockford, Reine Claude, Rutland Plumcot, Red Egg, Red June, Raynes, Sutton, Saunders, Smith's Orleans, Shipper's Pride, Shropshire Damson, Staunton, Santa Rosa, Satsuma, Shiro, Togo, Thanksgiving Prune, Vesuvius, Victoria, Warner's Late, Willard, Waugh, Washington, Yellow Egg, York State Prune.

Quinces.

The following sorts have been set for variety testing. Angiers, Bourgeat, Champion, Meech's Prolific, Orange, Pine Apple, and Rea's Mammoth and will be used for tillage and culture tests from now on.

Raspberries and Blackberries.

A small plantation of these was set out, but I regret to note that owing to the late date at which they were set, many of them did not live. A new plantation will be set out in 1909.

Orchard Culture.

Most of the young trees set this season have made a satisfactory growth but owing to the very severe drought, the late planted ones have not kept up with those set first.

A bearing apple orchard on the station grounds has been divided in five section to illustrate the effects of different methods of tillage.

Block I. Fall plowed, spring plowed, tilled until July, then sown to cover crop.

Block II. Both fall and spring plowed and tillage continued as long as fruiting will permit.

Block III. Spring plowed and tilled as No. II.

Block IV. Spring plowed and treated as No. I.

Block V. Sod mowed twice during growing season, the cuttings allowed to remain on the ground.

This method of culture was started in the spring of 1907 and with the serious drouth of the present season the effect of the sod was very marked by a general sickly appearance of the trees. The fruit was much smaller, though perhaps better colored, but decidedly more attacked by the codling worm. The sections which were tilled have shown very little difference as yet. All

the trees were thrifty and produced an excellent crop of high class fruit. We hope to continue this test for several years as an illustration of the effects of tillage.

Important Seedling. *Apple No. 1.* A seedling apple, was furnished by Mr. A. H. Culp, of Louth Township. Fruit medium, oblate, conic; color, yellow, splashed and mottled with bright crimson, handsome; stem, medium and slender, set in deep cavity. Calyx closed in shallow, smooth basin; thin skin; flesh, yellowish white; fine, juicy, mildly flavored subacid, slightly aromatic, good flavor, quality very good; season, November. May be useful to follow Gravenstein.

Offices, Laboratories and Directors' Residence at Horticultural Station, Jordan Harbour.

The orchard used for culture tests was also used for spraying tests for codling worm. Arsenate of lead, Paris green and the Norfolk Fruit Growers' formula: 1st spraying when buds begin to swell with 20 lbs. blue vitriol, 60 lbs. lime, and 200 gallons of water. 2nd, spraying just before buds break open; and third, spraying just as soon as blossoms fall with 12 lbs blue vitriol, 12 ozs. Paris green, 12 ozs. white arsenic, 2½ lbs. sal soda, 50 lbs. lime, 200 gallons water. Always use 10 lbs. water to the gallon.

These were all used, and the results seem to indicate that any of them will control the first brood of worms if properly and thoroughly applied. The arsenate of lead appears to cling to the foliage rather better than the others, and does not require the addition of lime to make it adhere to the leaves. Paris green when used with Bordeaux mixture gave fairly satisfactory results. Norfolk Fruit Growers' compound, while requiring somewhat more care in preparation gave excellent results. Three sprayings were used in all cases and the result was fruit comparatively free from worm.

Some patent formulas were used in a neighboring orchard for San Jose Scale, but we are not in a position to state definitely their relative merits from one year's test.

Fertilizers.

Through the courtesy of The Dominion Agricultural Offices of the Potash Syndicate, we were supplied with sufficient material to treat several vegetable crops with home mixed fertilizer. The following table will show the total yields and average weights obtained from one year's test. This will be tried again in 1909.

No. of fertilizer.	Onions.	Cabbage.	Average weight per head.	Tomatoes.	Musk melons.	Average weight of each fruit.	Cory corn.	Golden Bantam corn.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
No. 1—No fertilizer....	716	831	7	5,631	367	1	161½	135
No. 2 — Complete — 5 lbs. potassium sulphate, 10 lbs. superphosphate, 5 lbs. sodium nitrate.....	778	865	8	709	280	1	155	134
No. 3—5 lbs. sodium nitrate, 5 lbs. potassium sulphate.....	720	833	7½	574	199	1⅛	166½	149½
No. 4—5 lbs. potassium sulphate, 10 lbs. superphosphate	702	913	8½	685	310	1¼	143½	111½
No. 5—5 lbs. sodium nitrate, 10 lbs. superphosphate	850½	1,067	9	637	150	1	87	127

Several ready mixed fertilizers were used, but as the result was somewhat contradictory we wish to continue the tests for a series of years before comparing different brands.

The following mixture was used on a block of bearing apple trees: 6 lbs. sulphate potassium, 10 lbs. superphosphate, 4 lbs. sulphate ammonia to each tree. The results this year, however, were practically negative, as there was too little moisture to render the salts available. We shall watch these trees with interest next season.

VEGETABLE EXPERIMENTS.

Last spring we laid out a large block of land on which to carry out the experiments with varieties of vegetables. While these results are only for a single season, we are publishing them to give the growers an idea of how the varieties compared here in 1908.

Beets.

Out of 55 varieties of beets, the following one-half dozen were most satisfactory: Extra Early Flat Egyptian, Imperial, Eclipse Turnip, Detroit Dark Red, New Cardinal and Globe.

Cabbage.

Out of 89 varieties of cabbage, we might mention Acme Flat Dutch, First and Best, Winter Header, All Head, Square Deal and Early Flat Dutch as being the best one-half dozen, giving the largest yield of marketable heads. We did no work in early cabbage this year.

Cucumbers.

Owing to the very dry season, cucumbers were not a very great success. New Century Perfection, Improved Long Green, Evergreen, Giant Pera, and Hill's Forcing White Spine may be singled out as some of the most satisfactory for slicing purposes and Fordhook Pickling and English Gerkin Pickling two of the heaviest pickling varieties. 54 varieties were tested.

Watermelons.

Among the 42 varieties of watermelons that were planted, Black Spanish, Pride of Georgia, Early Canada, Seminole, Early, The Boss and Angel's Kiss were most satisfactory.

Muskmelons.

This year we grew 97 varieties of muskmelons, and the following are some of the varieties giving a good yield and being of good quality: Emerald Gem, Unsworth Perfect, Burrel Gem, Eden Gem, and Banana Citron.

Pumpkins and Squashes.

We planted 22 varieties of pumpkins and 42 varieties of squashes, but our results were somewhat interfered with by severe attacks of blight. This work will have to be duplicated next year.

Beans.

Among the 104 varieties of beans, we would recommend Earliest Hopkins, Red Valentine, Long Pod Forcer, Davis Kidney, Bountiful Bush, Early Red Valentine, Longfellow and New California Wax, as early varieties. Prolific German Wax, Dwarf Horticultural, Stringless Green Pod, Mighty Nice, XXX Best Green, Imperial Golden Wax, Giant Stringless Green Pod, ripen somewhat later, giving a succession of pickings. Hodson's Wax was decidedly the heaviest cropper we had, but New Pearl Wax, Black Wax, Refugee Improved and Large White Marrowfat are worthy of further trial and test for late crop.

Peas.

Out of the 109 varieties of peas that were tested, we would recommend: Extra Early, Rural New Yorker, McLean's Little Gem, First of All, Prolific Early, Market, and Clipper as early. Medium: French Canner, Improved Stratagem, Telegraph, Profusion, Heroine, Hordford's Market Garden, Mammoth Melting Sugar, Quality and Dwarf Gray Sugar. Late: Queen, Matchless, Early Dwarf, Brittany Sugar, Bliss Everbearing, Long Island Mammoth, Black-Eyed Marrowfat, Marblehead Early Marrowfat, Prodigious, and Royal Dwarf White Marrowfat.

Sweet Corn.

This year we grew 74 varieties of sweet corn of which Perry's Hybrid, Concord's Bearsfoot, Pearce's Early Evergreen, Early Champion, New Ideal Early, Howling Mob, Stabler's Early, Aristocrat, New White Evergreen, and Potter's Excelsior were the heaviest yielders. We might particularly mention Pearce's Evergreen, New White Evergreen, Stowell's Evergreen, Country Gentlemen and Golden Bantam as varieties of special quality.

Pop Corn.

We also had 7 varieties of pop corn, but so far we have found nothing to equal White Rice, either in vigor, quality, or yield.

Onions.

Out of 53 varieties of onions we might mention the following Italians as giving good results here this season: Largest Red Madeira and Mammoth Red Italian. Also we might mention Connecticut Large Red, Early Blood Red, Model Yellow Globe Danvers and Early Red Globe as being among the best cropping varieties, while Large Red Wethersfield, Southport Yellow Globe and Red Wonder gave very satisfactory results.

Cauliflowers.

34 varieties of cauliflower were grown here, Earliest Snowball, Extra Early Dwarf Erfurt, Queen of the Danes Erfurt, New Century, Earliest Dwarf Erfurt and Veitche's Autumn Giant giving us the largest yield and firmest heads.

Peppers.

We would suggest the following varieties of peppers as being useful for the market gardeners and the home gardener, Italian, Elephant's Trunk, Sweet Mountain, Golden Queen, Sweet Spanish, Procop's Giant.

Tomatoes.

This year we tested 77 varieties of tomatoes, Freedom, Extra Early Advance, and New Century giving exceptionally large yields. Extra Early Advance was somewhat too soft for shipping purposes, but may be useful for early local trade. Satisfaction, Dominion, Greater Baltimore, Success, Livingston's Royal Red and Great B. B., also did remarkably well, and I should like to call the attention of the public to a strain of Chalk's Jewel tomato which we grew here this year from seed supplied by Mr. W. C. McCalla. These were exceptionally fine tomatoes, and a heavy cropper. This goes to show what can be done by careful selection of seed.

Potatoes.

94 varieties of potatoes were grown here this year for comparative testing from seed secured from the O. A. C. The following varieties gave results which would indicate their value for this locality and soil, Davies Warrior, Roses New Invincible, Pearl of Savoy, Seedling (Miss Rose), Dewey, Montana Bluff, Extra Early Sensation, Rural Blush, White Elephant, Crown Jewel, Snowflake, Beauty of Hebron, Dempsey's Seedling, Early Rose, Early Manister, Queen of the Hebrons, Empire State and American Wonder.

Peanuts.

We also grew a few peanuts, and it may be of interest to know how they compared in total yield: Hardy Northern, Spanish, Pistache and New Mammoth Bush. Only four varieties tested.

Chards.

Among the chards, Swiss Improved and Beck's Improved Sea Kale gave us the best yield; were both good quality. 6 varieties were grown.

Egg Plants.

Of the 14 varieties of egg plants which we tested here, Long Purple, New Orleans, Black Pekin, and New York Improved were the most satisfactory this season.

Lima Beans.

We grew 19 varieties of Lima beans here this season, but we think the growing of Lima beans in this locality is not to be recommended. For those who care to try them, we would recommend Henderson's Bush Lima, Dwarf Bush Lima, Fordhook's Bush Lima, and Wood Prolific Bush as being the most satisfactory.

Plant Breeding.

Some work in this line was commenced early in the season, and we have at present a large number of strawberry hybrids ready to set out early in the spring. Also a considerable number of seeds of other fruits, which will give us a very nice collection to begin with, and as this will likely prove one of the most important features of our work, a considerable acreage has been laid out for the purpose of growing cross-breed and other seedlings, which work will be resumed in 1909 with a considerably increased force of workers.

Improvements.

This year we established a small canning plant, and did some preliminary work in testing varieties of fruits and vegetables for canning purposes, and hope to have everything in good shape for our work in 1909.

The following buildings have been erected this summer which will greatly facilitate the work we are carrying on: The barn, which gives accommodation for our horses, tools, implements and fodder with a large store-room for fruit packages and spray materials, in the basement of which we have a large cellar for storing fruits and vegetables, also a small cold storage plant which will afford us the opportunity of holding over certain crops beyond the ordinary shipping time.

The Administration building with the necessary offices and work rooms, with a small green house attached, the Director's residence and cottage for teamsters are nearing completion. With these buildings, we have secured sufficient space for our present needs with the exception of a foreman's residence which we trust may be added at an early date.

Conclusion.

In closing, I wish to express my appreciation of the efficient services rendered by those who have been associated with me during the past year in the work here, and to the public generally, for the hearty co-operation which has marked their approval of the work which has been outlined at the Horticultural Experiment Station.

STRAWBERRY REPORT.

By E. B. Stevenson, Guelph.

The strawberry season for 1908 was one of success, and when we compare it with that of 1907 we may congratulate ourselves upon the returns. A good crop is of importance not only for its value financially, but also marks an advance in the improvement in the berry, in methods of culture, and selection of improved varieties. The question of the improvement in varieties is a very real one at the present time. There are a great many growers now engaged upon the problem of the perfect strawberry all over the United States and Canada. One of the great hindrances to a good crop was absent here the past season, viz.; late frosts. We were free from them, although one or two nights were very close to frosts. But we had a very wet time during the season of blossoming, which is sometimes almost as great a drawback as frost. Cold rains have proved themselves almost as damaging to a full crop as frosts, the wet interferes with pollinization by wetting the pollen, making it too damp to be blown about by the wind, or to adhere to the bodies of insects, and thus be carried by them from blossom to blossom.

One of the most important things for a good crop is a bright warm time during the period of bloom, as only a third or fourth of the blossoms are open at the same time. If we have bright sunny days while the blossoms are out, we are sure of well fertilized berries of good shape, and not the nubbins that we get if we have cold wet weather during the season of bloom.

I made some preparation for frost in the shape of straw piles and damp rubbish with which to make smudge fires at night, but only lit them one night when it appeared the temperature was going down near frost, but did not. Although we had a wet time, still there was a good deal of warm sunny weather during bloom, and so obtained a good crop of well fertilized berries with few nubbins. I have on occasion saved the crop from frost by means of smudge fires when other growers who had not made such provisions lost their early berries. The vapor of smoke prevents the destructive action of frost just as does the vapor of a cloud. We know that in cloudy weather there is not so much danger of frost as on a clear night.

I was again well satisfied that the method of the narrow row is the best system for the commercial grower, and that the wide matted row is not the most profitable method. I would again lay emphasis upon the necessity of narrow rows. From my own experience, and from somewhat extended observation, I am sure that if commercial growers would follow the narrow method they would reap more money from their strawberry plantation.

Preparation of Soil.

One or two years should be given to root crops, either potatoes, turnips, or corn, manured and worked, then after the root or corn crop has been taken off, plow in full and work well in the following spring. After the ground is thoroughly prepared, choose good, strong, healthy plants that have never fruited, taking up the whole row for plants, discarding all tips and poor old plants, keeping the roots damp, not allowing wind or sun to dry the roots. Plant carefully, keeping the crown just even with level of the ground, making the rows three and a half feet apart and two or three feet in the row, according to the kind. Do your planting as soon as the ground can be worked well after all danger of hard frost is over. As soon as planting is over then

Fruit Growers' Homes: A Comfortable Frame Residence near Grimsby Park.

begin the work of cultivation, and especially after every rain, to keep a dust mulch and prevent drying out. I notice that some growers and nurserymen advise the removing of all runners until middle of summer. This they say strengthens the parent plant, enabling it to send out stronger runners later on. I do not advise, and have never pursued this plan. I make sure of good, strong, young healthy plants to start with, and if well planted these will soon begin to throw out one or more strong runners that will in turn send out other strong runners. The early, well rooted plant will soon make a row wide enough for fruiting. Keep all other runners cut off, let those new-made plants spend all their time till fall in making fruit crowns and storing up strength to mature the crop of next season.

The past growing season has proved the correctness of my contention to get the young plant rooted as soon as possible. I am sure those who have pursued the other method of cutting off all runners until the middle of summer will have a very poor stand of plants to fruit in 1909. As the long drought of 1908 commenced the middle of August and continued until the cold weather came, the ground became so dry and hard that no runners could root except those that had done so before the dry season set in. In a great many plantations, the stand of plants will be very small, as all late runners have been unable to take root and so cannot be depended upon to bear fruit next spring. This will be quite a serious loss to those who practiced keeping all runners off until the middle of July. Some of the varieties with me have made a good row as I encouraged them to root at once as soon as they first made runners, others that are not free runners have only made a thin stand of plants, so that I feel sure that next spring plants will be scarce and dear.

Prices of berries were good, running from 17c. per box that I got for the first pickings of 3 W's, to 8c. during the glut for a few days only. Large graded berries, smooth and faced in the box, sold regularly at 10c. and 12c. by the crate. I sold the bulk to one dealer who took all I could supply. The season began fully two weeks earlier than that of 1907. Blossoms began to open about May 15th. Among the first in bloom here were the Gill, 3 W's on a southern slope; Elba, Michels, Van Deman, Ruby, Early Beauty, Oom Paul, Young's Early Sunrise, Howard's No. 3, Early Market.

Fall Bearing Varieties.

I would desire to repeat what I said last year as to the so-called fall bearing kinds. After another year's trial, I cannot speak any more favorably about them. The dry summer seemed to be especially hard upon them. They only produced a few small, soft, poor flavored berries of very little value. I would say again from my experience that the fall growing of strawberries for profit is a failure and would not recommend any one to try it.

The season of 1908 had one or two surprises. There were a few varieties that moved up to the front in spite of any drawbacks. One of the varieties that surprised me was an extra early one by the name of Gill. Of the extra earlies, Fairfield, Excelsior, Oak's Early, Success, did not come up to their average and might be called failures this year. Van Deman was as good as usual, but the Gill was indeed a success. This was my first time of fruiting it. It was not petted in any way, and got no better treatment than any of the other 150 varieties I fruited. It was a surprise, as I was not expecting it. It was one that was sent me a year ago among some others by Mr. Crawford, of Ohio. I had not heard anything about it up to the time

I saw it fruit on my plot. I was going over my bed one day towards the upper end to look at some 3W's. They looked as if they were in bloom. On my way there I passed the Gill plants. I saw what looked like a ripe strawberry on the Gill. I stooped down and saw not only one but several ripe berries. Nearly every plant had one ripe berry. This was June 9th, before there were any ripe ones on any other variety—even the Michels were only getting white; and on the 11th of June I had a good picking of Gill's.

Since then, I have been enquiring about it, and I find it has done very well in other places, viz.: Ohio Experimental Station has fruited it twice, and says of it: "Conical, sometimes broadly conical, or slightly flattened, usually smooth and uniform; color, light red or scarlet, seeds yellow, prominent, flesh pink, only moderately firm; quality, quite mild, pleasant, but not highly flavored; plants rather low, compact, vigorous, showing but a trace of leaf blight. This variety attracted attention throughout its season by its bright, showy berries and great prolificacy. The last berries ran quite small, but only after producing a generous crop of attractive, marketable fruit."

I was very much pleased with it, and in a season such as the past, when we have no late frosts, it would be a very profitable berry, as we could have picked it nearly a week before the others.

Another variety that especially pleased me the past season was the Joe. I have fruited this variety some years now, but never saw it do as well as this year. It has always done well, and I have spoken highly of it, but it was very fine this season. It was one of the largest and handsomest of all the big mid-season varieties, and was so productive that it would satisfy any one in that respect. The Joe has not had the prominence given it that it has been deserving of. It is one of the pedigreed seedlings that was sent me eight or nine years ago by Jos. H. Black, of New Jersey. Nettie was another, a very late one, and is taking first place as a very large and very late sort. The Joe does not appear to have come to the front as it ought to have done, simply because it is not known. Growers for some years have been looking for a large late kind, and while Joe is not as late as Nettie or Latest or Sandy, yet in my opinion, it it better than any one of them. It is about the same season as Sample. It is large, regular, uniform in size, brilliant color, bright yellow seeds, firm, flesh red, fine flavor, plant healthy, vigorous, good grower and productive. Is not that enough? It is a very beautiful looking berry, as if varnished, and with its yellow seeds is very showy. It gets this quality from its parent, the old Middlefield.

Among some of the other good new ones, I might mention the Golden Gate, Saratoga, Goldsborough, King Edward, Brilliant, Good Luck, McNeil, World's Wonder, Oswego. Among the older kinds that were fine Three W's; President, Minute Man, Mead, Pocomoke, Beidler, Kitty Rice, Uncle Sam, Buster, Hummer, Jacoma, Hundred Dollar, Abundance Auto, Arnout, Ekey, Chesapeake, Steven's Late Champion.

The old standards made a good showing and still hold a front place such as Sample, Glen Mary, Splendid, Tennessee Prolific, Haverland, Parson's Beauty, Ruby, Williams, Brandywine, Latest, Warfield, Wm. Belt, Senator Dunlap, Bederwood, Margaret, Marshall, Ridgeway, Van Deman, Woolverton, Cardinal, New York. The season was over by the 5th of July, two weeks earlier than the season of 1907.

List of Varieties.

Abundance (Perfect): Sent me by S. Woodruff & Sons, New York. Plant a good healthy grower, making plants freely, quite productive, very good size, bright scarlet, yellow seeds, conical, firm, good quality, not too late, a good one.

Arnout (Perfect): Sent me by J. L. Arnout in 1906. One of the best new kinds, did very well with me the last season, a fancy berry. The plant is strong, healthy, and a good grower, and quite productive. The berry is large to very large, conical, bright scarlet, yellow seeds, flesh white and pink, medium in firmness, medium to late season.

Abingdon (Perfect): From L. Blanchard, of Massachusetts. Plant healthy, strong grower, medium in productiveness, berry is large, roundly conical, crimson and red seeds, good quality, late season, first berries irregular, a fancy berry.

Auto (Perfect): From Maryland. The plant is large, strong, healthy, and quite productive. The berry is large to very large, dark scarlet, yellow seeds, roundish with red flesh, firm for so large a berry, good quality, well worth a trial, a good one.

Armstrong (Perfect): This is almost if not quite the same as Corsican, New York, Maximus and Uncle Jim; the plant is healthy and strong and quite productive, grown largely as a fancy berry . The berry is large to quite large and fair flavor.

August Luther (Perfect): A good early plant, quite healthy, but small; good runner, medium in productiveness, in some soils does very well, medium in size.

Alice Hathaway (Perfect): Sent me by the originators, Hubach and Hathaway, Arkansas. The plant is quite healthy, a good runner, and quite productive. The berry is medium in size, bright scarlet, good quality.

Annie Hubach (Perfect): Sent me by Hubach and Hathaway. The plant is healthy, good runner, making plants freely, light green color and quite productive. The berry is medium to large in size, a bright scarlet color with yellow seeds, pink flesh, medium quality, mid-season, looks well in the basket, sells well.

Aroma (Perfect): One of the late kinds, a standard, largely grown in some localities. The plant is dark green, healthy and fair runner. The berry is large, round, firm, about same season as the Gandy, does better in some soils than the Gandy.

Brilliant (Perfect): Somewhat like Gandy, plant a good strong grower, making plants freely, and productive. Berry is very regular in shape, season late, will give further trial.

Bower (Perfect): A new one from Missouri. Plant is large, making few runners, berry is large, long in shape, firm and quite good quality, will give further trial. Appears to be a good one from one fruiting.

Bradley (Perfect): Appears to be a good late sort. Plant healthy, good grower, and productive, would like to give another trial before deciding on its merits.

Blaine (Perfect): Sent me by the originator, J. W. Blaine, of Iowa. The plant makes a fine growth, healthy and strong, good runner; a cross between Bederwood and Lovett, foliage, light green color, and broad leaves. The berry is large, firm, good bright color and good flavor, season late.

Buster (Imperfect): This was sent me by the originator, C. C. Stone, of Illinois. The plant is very healthy, strong and good runner, dark green foliage. The berry is large to very large, scarlet, medium in firmness, quite productive, season late, fair quality, a good one for near market.

Beidler (Imperfect): This is one of M. T. Thompson's, of Virginia. The plant is a good, healthy, strong, vigorous grower, and productive. The berry is large with a large neck, sometimes wedge shaped, bright red, quite firm, good quality, solid red flesh, mid-season, a good one, did well this season.

Bederwood (Perfect): One of the best early kinds so well known and widely grown no need to describe.

Bismarck (Perfect): One of the old well-known sorts, did well again this year. Plant very healthy, very productive, one of the best.

Bubach (Perfect): One of the old standards, is weakening somewhat in plant vigor; has held its place in front rank for a long time, but is being crowded out now by new varieties.

"Greening" Apple in Bloom, Durham County.

Brandywine (Perfect): One of the best mid-season to late kinds. Plant is very strong and a free runner, largely grown in some places. It is productive, berry is large, quite regular in shape, dark bright red and of best quality.

Chipman (Perfect): Originated in Sussex Co., Del. Sent out by W. S. Todd. The plant is strong, upright grower, large and healthy, with broad, bright, glossy, green foliage, showing no trace of rust. The berry is large regular in shape, early to mid-season, color a dark red, glossy, flesh red, and good flavor. It is firm, and I believe will ship well; worth a trial.

Colossus (Imperfect): Plant dark green, strong and healthy, fair runner, and quite productive. Berry is large and bright, dark scarlet, resembles the old Bubach very much indeed, both in plant and fruit.

Chesapeake (Perfect): Comes from Maryland, and introduced by W. F. Allen. The plant is large with thick leathery leaves, quite healthy, only medium in productiveness. The berry is large, round with a nose, bright, glossy, scarlet, resembles Bismarck; solid, flesh white and pink, worthy trying by those looking for large, late, firm berry.

Commonwealth (Perfect): A good late sort, originated by W. H. Munroe, of Massachusetts. Plant healthy, good growers and quite productive. The berry is large, dark, glossy, red, firm, good quality, will ship well, quite late.

Cardinal (Imperfect): Sent me by Mr. Streator, of Ohio. The plant is a healthy free runner, but must be well fertilized to produce well. The berry is large, bright, glossy and very firm and good flavor.

Clyde (Perfect): One of the best known, originated by Dr. Stayman, of Kansas. Plant is weakening, does not produce foliage enough; the berry is very large and good quality, light scarlet color.

Corsican: Same as Armstrong.

Diamond (Imperfect): Sent me by J. A. Baner, of Arkansas. The plant is a strong, vigorous, healthy grower, and quite productive; will give further trial.

Dixie Belle (Imperfect): Plant vigorous and free from rust. Berry large, regular in shape, bright red; comes from North Carolina; will give further trial.

Dighton Rock (Perfect): Sent me by A. B. Howard, of Massachussetts. Plant healthy. Vigorous grower, did fairly well; will try it another year before deciding its value.

Ekey (Perfect): This did well, and the fruit was extra fine. The plant is a good strong grower, healthy and productive. The berry is large, long, bright, dark, glossy, red with red seeds, solid and firm; so different from other kinds in appearance that it attracts attention, quality is good, season early—medium and short. The whole crop ripens almost at once, two or three pickings and it is over.

Early Hathaway or Texas (Perfect): Sent me by the originator, in 1902; afterwards introduced by another party as the Texas. It is quite well known now by one or other title. Originated by same as the Excelsior; is a little later than Excelsior, larger and a heavier yielder; foliage is dark and healthy, a fair runner, berry roundly conical, red flesh, good quality, medium to large, a good medium early.

Early Market (Perfect): Plant quite healthy, makes runners freely and productive, runs through a long season, a good early, the berry is medium size and roundish and fair quality.

Early Beauty (Perfect): Introduced by Mr. Crawford, who sent me plants. Plant is a good runner and healthy, and quite productive, berry roundish, bright red, flesh red, did well the past season.

Ernie (Perfect): The plant is a strong, healthy grower and quite productive; a good early sort. The berry is large for so early a berry; it is a good red with yellow seeds, round, a good medium early, worth a trial.

Elma (Imperfect): Sent me by the originator, J. H. Black, of New Jersey. It is a cross of Nettie and Robbie, fertilized by Joe. The plant is very healthy, no trace of rust, strong grower and quite productive. The berry is large to very large, roundish in shape, a bright red color, pink flesh, medium firm, very late. One of latest.

Evening Star (Perfect): A seedling of Gandy. Plant is a good grower and healthy; berry is large and quite firm, some claim that it is a better late one than the Gandy, it did well the past season with me, I will give it another trial. I have only fruited it once.

Emperor and Empress (Perfect): These two sorts are so much alike, can note very little difference between them. Originated by the late John Little, of Granton, Ont. The plant is strong and healthy, berry is large and fine looking and good quality.

Fountain (Perfect): Plant is healthy and very vigorous grower, and quite productive. The berry is large, conical, firm, a fine dark scarlet with yellow seeds, a good flavor, a good shipping berry, did very well again this season.

Florella (Perfect): A seedling of Bubach, plant healthy, a good grower, quite productive, the berry is large, bright glossy red, blunt heart shaped, flesh red and solid, somewhat irregular, early mid-season.

Golden Gate (Perfect): Originated by S. H. Warren, of Massachussetts. A vigorous grower, makes large plants with luxuriant foliage and quite productive. The berry is large, bright dark scarlet, roundish with a neck, yellow seeds, good quality. It has strong staminate blossoms with a lot of pollen. I should say from one fruiting this will prove a good one. I was very pleased with it. I would recommend it.

Gill (Perfect): A good extra early, sent me by Mr. Crawford, of Ohio. The plant is thrifty and makes runners freely, is healthy, light color and quite productive. The berry is rounded, conical, large, scarlet, yellow and red seeds, good flavor, extra early; well worth a trial, did very well first year of fruiting.

Good Luck: Sent out by W. F. Allen, Maryland. Made a good showing the past season. The plant is one of the strongest I have on my place. Vigorous and healthy, originated by E. Pedrick, of New Jersey. The fruit is as large as Gandy, as productive and almost about the same season. Conical, dark glossy red, ripens all over at once, no green tips; a good one.

Goldsborough (Perfect): Originated by A. T. Goldsborough, of Washington, D.C. The plant is healthy, tall and upright, a good grower and quite productive. The berry is round, regular and smooth, bright scarlet with yellow seeds, spicy flavor, flesh red all through, a good one, worth a trial. Did well with me.

Great Scott (Imperfect): Introduced by S. H. Walter, Massachussetts. The plant is a good one, healthy and good grower. No rust. The berry is large, a bright scarlet, good quality and quite productive.

Gov. Rollins (Imperfect): Originated by Benj. Smith, Massachussetts, and named in honor of Geo. Rollins, of New Hampshire. The plant is medium in size but healthy. Berry is large and firm, dark red and good quality and productive, holds its size to last picking.

Gen. Joe Wheeler (Perfect): Introduced by W. F. Allen, Maryland. This is a southern berry, supposed to be a seedling of Lady Thompson, and resembles that variety very much; did only fairly well; will give further trial.

Glen Mary (Perfect): Introduced ten or twelve years ago by W. F Allen. It is well known and widely grown, one of the standards. Plant is strong and healthy, large dark green foliage, the berry is large, irregular, dark red, prominent yellow seeds, flesh red, good quality, is a good firm shipper, it is popular for fancy local market, few any better.

Gandy (Perfect): A standard late, very well known, made a good showing on my place past year.

Greenville (Imperfect): Resembles the Bubach; berry is not as large; the plant is healthy, dark green a good runner and quite productive; berry is large, bright red, medium in firmness, a good one.

Haverland (Imperfect): One of the standards, and most productive: the plant is a strong grower and good runner, a great favorite with many: its only weakness is its weak fruit stalks, being unable to hold up the mass of berries it produces.

Hummer (Perfect): Sent out by W. F. Allen, 1907. It is well named, for it is a hummer. The plant is large, healthy and good grower and quite productive, the berry is large, bright scarlet, pink flesh, yellow seeds, firm good quality, a good one, all growers should try it.

Hundred Dollar (Perfect): Sent me by introducer, W. Hathaway, of Ohio. The plant is large, strong and healthy, a good grower, fairly productive. The berry is of the largest size, scarlet, with red seeds, flesh white or pink, good mild flavor, resembles Woolverton, also Ryckman, a fancy berry, a good one.

Heflin's Early (Perfect): A good early kind. The plant is a fair grower. Berry is a good size, firm and of good quality.

Howard's No. 3 (Perfect): Originator, A. B. Howard, of Massachusetts. A seedling of Clyde, and shows its parentage in its productiveness and color of plant; a rampant grower and very productive. Berry is medium to large, conical, firm, bright, scarlet or yellow seeds, a good early market variety.

Howard's No. 7 (Imperfect): Seedling of Haverland and Marshall, sent me by A. B. Howard. Plant is healthy, good grower and productive. The berry is conical, good flavor, of good size.

Howard's No. 103 (Imperfect): A seedling of a Crescent and Clyde cross sent me by originator. The plant is healthy, a good grower and productive. The berry is large, roundly conical, dark red and firm. Seeds somewhat early.

Howard (Perfect): Seedlings of Button's E, fertilized by Gandy, sent me by originator, J. H. Black, of New Jersey. The plant is large, strong and healthy, very dark green foliage. Berry is large, dark red and firm, season late, fairly productive, a fine looking berry.

Howard's No. 2 (Imperfect): Originated by late G. W. Howard, of Michigan. The plant is small, a good runner, some rust, but quite productive. The berry is good size, roundish, solid flesh, pink, good quality. Did very well the past season.

Howard's No. 96 (Perfect): Originated by late G. W. Howard. The plant is healthy, good runner and quite productive; berry is medium to large, dark scarlet color, flesh red, solid, firm and good quality, late.

Ham (Perfect): Sent me by originator, J. H. Black. A seedling of Mary and Parker Earle; it resembles Mary very much. A good healthy grower; very dark and green foliage, medium in productiveness; berry is large, dark red, flesh red, good flavor, firm and smooth.

Irena (Perfect): Sent me by originator, W. S. Butler, of Wisconsin. A seedling of Jesse and Warfield. The plant is a good healthy grower, making plants freely. With me it could not have been well fertilized, as I got very few berries from it, will give further trial, a failure so far.

Ideal (Perfect): A seedling of Bubach and Hoffman, by Mr. Kerr, of Maryland. Plant is a good healthy grower and fairly productive. The berry is true conical, every one as if turned in a lathe; bright scarlet, yellow seeds, fair quality, berries all same size and shape, firm, fine looking, but weak in productiveness.

Jacoma (Perfect): A good one. The plant is healthy, a strong grower, makes plants freely and is quite productive. The berry is large, bright red, medium in firmness, of good quality, worth a trial, and did well with me.

Joe (Perfect): Sent me by the originator, J. H. Black, of New Jersey, eight years ago. Has always done well; better this year than ever before. The plant is healthy, a good grower and very productive. The berry is large and regular in shape, a bright glossy scarlet, obtuse, conical, uniform in size, fine quality, season medium to late. A very good one.

Johnson's Early (Perfect): Medium early plant, small dark green foliage, never has done very well here on my soil; berry sour, not productive enough, said to do well in some places. I shall drop it.

King Edward U.S. (Perfect): Sent me by the originator, D. J. Miller, of Ohio; has done well. The plant is very large, healthy and strong, a good runner, rooting quickly and easily and quite productive. The berry is large, roundish, a bright scarlet with red seeds, firm, flesh white, of fine quality, a good one. Not yet introduced, will be offered for sale spring 1910.

King Edward, Ont.: Sent me by Mr. Chrysler, of Galt. Plant is healthy, fair grower, fairly productive. I have fruited it once; will give it further trial. It is unfortunate that we have two new ones of the same name. It will cause a good deal of confusion, and make the names too long to distinguish the one from the other.

Kitty Rice (Imperfect): Comes from Ohio. Has always done well. The plant is a good grower, strong and healthy, makes runners freely and quite productive. The berry is large, roundish, a fine glossy red, firm and good quality, looks well in the basket, a good one.

Latest (Imperfect): Sent out by S. H. Warren, of Massachussetts, from whom I got my plants. Plant is healthy and large, does not make many runners, stools out and is quite productive; a good one for the hill system. The berry is large, crimson, conical, firm and good quality, season the latest. A very promising later variety; berry not quite as large as Nettie, but better looking, more attractive.

Louis Hubach (Imperfect): From Arkansas. Sent me by the originator. A seedling of Warfield and Lady Thompson. Plant a good runner, healthy and productive. The berry is a bright red, with yellow seeds, conical, flesh red and solid, fair quality, medium in firmness, a good market sort.

Lyon (Imperfect): Plant good runner and productive. Berry is long and pointed, a dark glossy red with red seeds; flesh red, fair size; resembles the old Longfield. Medium to late, good quality.

Lester Lovett (Perfect): A second Gandy; so much like it in plant and fruit and season. No difference can be seen between them. No doubt a seedling of Gandy.

Miss Boston (Imperfect): Plant healthy, a good grower, dark green foliage. Berry large, bright red, fair quality; fruited once, will give a further trial.

McNeil (Perfect): Plant strong, healthy grower, dark green foliage, productive. Berry large, oblong, roundish, flesh red, medium in firmness, fine quality, a good one and worth a trial.

Mrs. Mark Hana (Perfect): Plant healthy, a good strong flavor, some rust. Berry large and fine, only medium in productiveness.

Mrs. Miller (Imperfect): The plant is a strong healthy grower, not very productive; the berry is large, bright red, oblong, somewhat flattened, season, medium, late.

Millie Hubach (Imperfect): Sent me by the originators. The plant is a good plant maker and quite productive. The berry is a bright scarlet, with yellow seeds, conical, with slight neck, flesh pink and white, good quality, a good market sort, did well this season.

Mead (Perfect): Originated by H. O. Mead, of Massachussetts. It has done well, is a good one. The plant is a good grower, healthy, runs freely, dark green foliage. The berry is large, bright red, coloring all over at same time, firm, good quality, worth a trial by all.

Minute Man (Imperfect): Here is a good one, very promising. The plant is a good strong grower, somewhat like Senator Dunlap; free from rust

and quite productive. The berry is very regular and smooth, large, crimson, with yellow seeds, flesh reddish pink all through, good quality, medium firm, worth a trial.

Margaret (Perfect): Plant is healthy, and if it gets good treatment will produce the first berries. Will not stand neglect, one for the amateur grower.

Marie (Perfect): A fine market berry, a seedling of Crescent, very productive, of good large weight, berry acid but spicy, medium firm.

New York (Perfect): See Armstrong.

Nettie (Imperfect): One of last late, sent me by originator, J. H. Black, of New Jersey. Plant a good strong grower, free plant maker and quite productive. The berry is one of the largest but irregular, only medium in firmness. It is perhaps the latest. Has done well with me.

Oak's Early (Perfect): The plant is small but a good vigorous grower, and quite productive; berry is medium in size, dark red, with red seeds, flesh red, early to mid-season.

Oswego (Perfect): Sent me by L. J. Farmer, of New Jersey, who introduced the variety 27 years ago. The plant is quite vigorous, healthy and good grower and productive; the berry is roundish, of good form, large, mid-season to latest; fruited once. It did well; worth a trial.

Parson's Beauty (Perfect): Comes from Maryland. Plant is healthy, good grower, strong, dark green foliage, quite productive; the berry resembles the old Wilson, a dark rich scarlet, yellow seeds, firm and good quality, a good market sort.

President (Imperfect): A good one for fancy market. Plant is a good grower, but develops some rust, fairly productive. The berry is large and fine looking. Medium in firmness. Has done well with me.

Pan American (Perfect): A sport of Bismarck, grown as a fall bearer. No value for market. I have given it a trial for four years, bears a few berries through the summer, and into October; not of much value.

Prof. Fisher (Perfect): A seedling of Bubach and Sharpless. Plant is strong, large, healthy and produces a few very large and fine berries, but not enough.

Red Bird (Perfect): Sent me by W. F. Allen, of Maryland. It comes from the south; an early sort, makes plants freely; healthy, and quite productive; I should say quite productive for an early berry. I have fruited it once; a good color, medium in size. It is promising as an early kind.

Ridgeway (Perfect): Here is a good old kind. Has always done well, producing some of the finest berries of any plant; is large, healthy, stools out; does not make many plants, but is quite productive. The berry is large, roundish, a dark bright red, with golden seeds, firm and good quality. Worth trying.

Ryckman (Perfect): A fancy berry. Plant is large, free grower. Berry is large with a neck conical; very good flavor, medium in productiveness; resembles the Woolverton. Would fill in fancy market.

Ruby (Perfect): An old standard, one of the good ones; good plant maker, dark foliage and productive. The berry is large, conical, good quality; has always done well; worth a trial by all.

Saratoga (Perfect): A seedling of Glen Mary and Sample, originated by Wm. Palmer, of New York, and sent me a year ago. The plant is large, resembles Glen Mary, makes plants freely, strong and healthy. The berry is large to very large, dark red color, good shape and productive, medium to late, a good one. I was pleased with it from once fruiting it.

St. Louis (Perfect): Originated by J. A. Baner, who sent me plants of it. The plant is a healthy good grower. It ripens its crop in short time as early as Excelsior. Will give it a further trial; I have fruited it once.

Sample (Imperfect): One of the best standards and best market kinds, very widely grown now. Has always done well, with plant healthy and vigorous and very productive.

Splendid (Perfect): This is one of the most profitable market sorts, has always done well; the plant is a healthy vigorous grower and quite productive. The berry is large, round, bright color, scarlet, firm, a good shipper. All should try it; one of the best; well named.

Success (Perfect): Plant a good grower, productive. Berry is large, roundish, conical, dark scarlet, firm, good flavor, a good early.

Senator Dunlap (Perfect): This is a good one; has always done well; a good healthy variety. Plant a good, strong, vigorous grower and very productive; berry conical, dark scarlet, firm, medium to late.

Stevens Late Champion (Perfect): Plant healthy, a good free runner and productive; berry is large, roundish, scarlet, with golden seeds, resembles Glen Mary, firm, good quality; a good late sort.

Tennessee Prolific (Perfect): One of the best market varieties; an old standard; has always done well; so well known needs no description, mid-season.

Three W's (Perfect): One of the most productive; did very well the past season. I have fruited it three times, and it seems to do better each time. The plant is a strong, healthy, vigorous grower, makes plants freely and very productive. The berry is large, conical and blunt at end, good shape, a bright, dark, glossy scarlet, with yellow seeds, fine flavor, firm pink flesh, medium to late season. All should grow this fine variety.

Texas (Perfect): Same as Early Hathaway.

Uncle Jim (Perfect): Like Armstrong; see description; a good fancy berry.

Uncle Sam (Imperfect): Plant is large,healthy, good grower and productive; the berry is one of the largest; roundish, bright glossy scarlet, with red seeds, good quality, medium firm, mid-season to late.

Virginia (Imperfect): Originated by Thos. J. Custis, of Virginia. A seedling of Hoffman and Sharpless. A good grower, runs freely, dark green foliage, productive, conical, blunt at end, medium in size, dark red with red seeds; flesh red; firm, mid-season, fair quality.

Van Deman (Perfect): One of the best early sorts here. Runs through a long season, does not do well with some growers. Plant is small, good grower; dark green foliage. The berry is conical, good size, bright, glossy, dark scarlet, with yellow seeds; very handsome, firm, and best quality.

Victor (Perfect): Plant a good strong grower, dark foliage, and productive. The berry is large and fine looking, dark crimson, with yellow seeds; firm and good quality, originated by D. J. Miller, of Ohio.

Wonder (Perfect): Or Sampsell's Wonder. Plant a strong grower and productive. Berry is large to very large, dark bright red and good quality, medium to late season, a good one.

Wm. Belt (Perfect): One of the best old kinds; did very well again the past season, but had some rust on the plants; the first or king berry is often very irregular, but the remaining berries are very regular and fine. The berry is a bright scarlet, firm and good quality, medium season.

Williams (Perfect): Widely grown for shipping. It can be picked before it is ripe, as it begins to color before it is ripe. Only medium in quality. Some seasons it rusts a good deal, but is a very productive variety, of large, good looking berries.

Warfield (Imperfect): One of the most productive when it gets plenty of water; very vigorous grower. The berry is conical, dark crimson; a good canning variety on account of dark color; plant is very sensitive to dry weather.

World's Wonder (Perfect): The plant is a strong, healthy grower and very productive; claimed to be as productive as the Haverland; it certainly did well the past season with me. The berry is large and very fine, a bright dark red and quite firm, for so large a berry; a good one, and worth a trial by all growers.

Woolverton (Perfect): Originated by the late John Little, of Granton, Ont. One of the largest and finest berries. The plant is a strong and healthy one, blossoms all open through a long season; a good pollenizer for pistillates.

Yant (Perfect): The plant is healthy, light colored foliage, strong grower, productive, the berry is large, regular, with a neck, mid-season to late, a good one.

New Varieties for Trial.

Last spring I had a number of new seedlings sent me by the originators and introducers of new varieties for trial. I have them planted in a trial plot with the older kinds for next year's fruiting. Some of them have made a very good showing considering the drouth we have had during the growing season. They are as follows: Bountiful, Battenburg (Goldsborough), Chas. Newman, Dickey, Jim Dumas, Feudall, Myer's No. 1, Howard's No. 1, Early Harvest, Island King, Minnie's Early, Mammoth Beauty, Pocahontas, Penn Dutchman, Southern Beauty, Shipping King, 1st Quality, W. H. Taft, July 1st. And the following sent me by A. T. Goldsborough, of Washington, D.C.: St. Louis, Taft, Outlands, Battenburg, Howard's No. 2 and 17 and Highland.

List for Growers and Seasons of Fruiting.

Extra Early and Early: Gill, Van Deman, Michel, Success, Heflin's Early, Early Hathaway, Howard's No. 3, Staples, Bederwood, Excelsior, Oak's Early, Red Bird.

Early Mid-season: Ekey, Splendid, Golden Gate, Goldsborough, Tennessee Prolific, Warfield, Bismarck, Senator Dunlap, Haverland, Bubach, Parson's Beauty, Marshall.

Mid-season: Three W's, World's Wonder, Chipman, King Edward (U.S.), McNeil, Good Luck, Beidler, Hundred Dollar, Hummer, Glen Mary, Jacoma, Mead, Minute Man, Brandywine, Sample, President, Kitty Rice, Uncle Sam, Wonder, Arnout, Wm. Belt, Greenville, Virginia, Marie, Colossus.

Late to Extra Late: Aroma, Joe, Saratoga, Oswego, Gandy, Abingdon, Chesapeake, Latest, Stevens Late Champion, Commonwealth; Cardinal, Elma, Nettie, Howard's No. 96.

SPECIAL EXPERIMENTS.

REPORT ON CRANBERRY EXPERIMENTS, 1908.

By A. McMeans, O.A.C., Guelph.

The cranberry is more closely restricted by natural conditions than any other fruit industry of economic importance. The peculiar requirements of the plant limit its culture to regions possessing a cool climate, a rich alluvial soil, and where an abundance of sand is easily available, together with an almost unlimited water supply.

The Province of Ontario has depended on the United States for the bulk of its cranberry supply. Of late years, the Province of Nova Scotia is coming to the front as a producer of cranberries, the crop in that Province this year being estimated at 10,000 barrels.

The imports to Canada from the United States are as follows:

Year.	Amount in bushels.	Value.	Value per bushel.
1903	17,168	$37,412 00	$2 18
1904	21,662	53,365 00	2 46
1905	24,560	51,554 00	2 10
1906	15,091	39,160 00	2 59
1907	26,514	75,014 00	2 83
	104,995	$256,505 00	$2 44

The protective duty on cranberries is 25 per cent., thus making the average value of a bushel of cranberries $2.44 plus 61c., total, $3.05 per bushel, exclusive of freight charges. The present price of cranberries in Toronto markets are as follows: Cape Cod, $15 to $16 per barrel; Nova Scotias, $10 to $11 per barrel.

Some cranberries are grown naturally in Ontario; Parry Sound, Manitoulin Island, Simcoe, Prescott, and Norfolk counties, being the only places I know of where they have been marketed.

There is a marsh of seven or eight acres on the farm of Mr. Ackerman, Delhi, Ontario, where cranberries have been growing for a number of years. Of late years the owner has been harvesting and selling them for profitable prices, but he did not know anything regarding cultivation or propagation of the vines, with the result that the vines grew in patches, and generally matted so heavily as not to produce a full crop.

A small plot was cleared on the above marsh, and was planted on June 9th, as a test of some seven varieties. The following varieties were secured from Nova Scotia: Large Bell, Neily Bell, and Large Cherry; Early Black, Howes, Centreville, and McFarlin were secured from Cape Cod district. The vines have done very well considering the dry weather of the past season. Mr. Ackerman is very much interested, and has prepared during the past summer, one-half acre of the marsh, and would be pleased to plant it out as a larger test feeling sure that cranberry growing can be made a profitable business in Ontario where carried on under suitable and proper conditions.

Another small plot consisting of the same varieties was planted at Dunnville on June 10th, at the request of Mr. M. J. Cleary of that place, but owing to the conditions not being as suitable, they have not done so well.

When in a commission house in Ottawa this fall, I saw eighty-five bushels of cranberries that were grown in the vicinity of Plantagenet Springs, there being some bogs there capable of development.

Communications have also been received at the College from Midland, Orillia and Londesborough, regarding the cultivation of cranberries, suitable soil, etc.

I may also state that the estimated price of preparing and planting an acre of bog in the Cape Cod district varies from $250 to $300. The yields of fruit are quite variable. One hundred bushels per acre is considered a good average yield, and in the best seasons one hundred barrels per acre have been gathered. According to the United States census of 1900, Massachusetts had 5,128 acres devoted to cranberries, with a yield of 598,906 bushels, an average of 117 bushels per acre.

From the above it will be seen that with suitable conditions and a careful study of the subject, cranberry growing may be made to pay in Ontario.

FERTILIZER EXPERIMENTS WITH ONIONS.

By A. McKenney, B.S.A., Essex.

Owing to the fact that the season of 1907 was extremely unfavorable for the growth and maturing of the onion crop, this crop was almost a total failure in the Leamington onion section. A large part of the crop was scallions, and did not mature.

From one experiment conducted in 1907, with a complete fertilizer, marked results were obtained. The onions on this plot matured a month earlier than any of the others, and gave a large yield of perfect bulbs. This led us to undertake a series of experiments to find out if fertilizers affect the yield, maturity of the onions, and which fertilizer, or combination of fertilizers gave the best results.

Ten growers were selected on different portions of the marsh, and in each case five plots were laid out. In each case the experiments were conducted carefully and accurately, with very contradictory results. This may have been due to the season, which was a very dry one, the different methods of cultivation, the previous cropping and treatment of the soil. If it were possible to repeat our experiments on the same plots for another year, very favorable results might be obtained.

However, from a study of the results of the year's experiments, we have come to the conclusion that in order to obtain reliable and accurate data as to the value of fertilizers, when applied to muck soils, that it will be necessary to conduct the experiments upon soil of which we have definite information regarding its previous cropping and treatment.

If these experiments could be spread over a series of five years, with climatic conditions under observation, and mechanical conditions under control, we could, I think, be in a position to state definitely the value of fertilizers when applied to muck soils.

In order to do this, I think the co-operation plan should be abandoned, and at least one acre of land procured, and the experiments conducted upon this. This could be procured at a very reasonable figure, and with seeding, cultivation, and other conditions under our control, we should be in a position in five years at least, to collect much more valuable data than we could hope to in a co-operative way, with so many things occuring to make the results unreliable.

APPENDIX.

FRUIT PRIZE LIST AT ONTARIO HORTICULTURAL EXHIBITION, 1908.

APPLES.

CLASS 1.—EXPORT OF FOREIGN MARKET VARIETIES.

(a) Barrels ready for Shipment.

Baldwin: 1st, Gilbertson, Jos., Simcoe; 2nd, Norfolk F. G. A., Simcoe; 3rd, Johnson, Jas. E., Simcoe.
Ben Davis: 1st, Oshawa F. G. A.; 2nd, Chatham F. G. A; 3rd, Dempsey, Frank, Albury.
Golden Russet: 1st, Oughtred, W. C., Clarkson; 2nd, Chatham F. G. A.; 3rd, Guthrie, J. B., Dixie.
Greening (R. I.): 1st, Johnson, Jas. E.; 2nd, Dempsey, W. H., Trenton; 3rd, Oshawa F. G. A.
King: 1st, Norfolk F. G. A., Simcoe; 2nd, Gilbertson, Jos.; 3rd, Johnson, Jas. E.
Spy: Johnson, Jas. E.; Gilbertson, Jos.; Norfolk F. G. A.
Stark: Oughtred, W. C.; Oshawa F. G. A.

(b) Standard Boxes ready for Shipment (Unwrapped).

Baldwin: 1st, Thompson, R., St. Catharines; 2nd, Watson, W. G., Dixie; 3rd, Stewart, F. G., Homer.
Fameuse: 1st, Watson, W. G.; 2nd, Dempsey, W. H.; 3rd, Brown Bros., Humber Bay.
Golden Russet: 1st, Watson, W. G.; 2nd, Gilbertson, Jos.; 3rd, Brown Bros.
Greening (R. I.): 1st, Stewart, F. G.; 2nd, Norfolk F. G. A.; 3rd, Watson, W. G.
King: 1st, Watson, W. G.; 2nd, Thompson, Robt.; 3rd, Gilbertson, Jos.
McIntosh: 1st, Parker, W. C., Humber Bay; 2nd, Oshawa F. G. A.; 3rd, Stephens, C. L., Orillia.
Spy: 1st, Gilbertson, Jos.; 2nd, Johnson, Jas. E.; 3rd, Watson, W. G.

(c) Standard Boxes ready for Shipment (Fruit Wrapped).

Fameuse: 1st, Watson, W. G.; 2nd, Thompson, Robt.; 3rd, Norfolk F. G. A.
Gravenstein: 1st, Thompson, R.; 2nd, Norfolk F. G. A.; 3rd, Gilbertson, Jos.
King: 1st, Gilbertson, Jos.; 2nd, Oshawa F. G. A.
McIntosh: 1st, Parker, W. G.; 2nd, Harkness, A. D., Irena; 3rd, Oshawa F. G. A.
Spy: 1st, Norfolk F. G. A.; 2nd, Johnson, Jas. E.; 3rd, Gilbertson, Jos.
Wealthy: 1st, Oshawa F. G. A.; 2nd, Guthrie, J. B.; 3rd, Whyte, David, Woburn.

CLASS 2.—DOMESTIC OF HOME MARKET VARIETIES.

(a) Barrels ready for Shipment.

Blenheim: 1st, Brown Bros.; 2nd, Parker, W. C.; 3rd, Oshawa F. G. A.
Gravenstein: 1st, Oshawa F. G. A.
Ontario: 1st, Guthrie, J. B.
Tolman: 1st, Norfolk F. G. A.; 2nd, Oshawa F. G. A.; 3rd, Guthrie, J. B.
Roxbury Russet: 1st, Oshawa F. G. A.
Any other variety not named in Class 1: 1st, Norfolk F. G. A.; 2nd, Oshawa, F. G. A.; 3rd, Norfolk F. G. A.

(b) Standard Boxes ready for Shipment (Fruit Unwrapped).

Blenheim: 1st, Watson, W. G.; 2nd, Brown Bros.; 3rd, Oshawa F. G. A.
Gravenstein: 1st, Thompson, R.; 2nd, Guthrie, J. B.; 3rd, Gilbertson, Jos.
Ontario: 1st, Guthrie, J. B.; 2nd, Brown Bros.
Ribston: 1st, Norfolk F. G. A.; 2nd, Guthrie, J. B.
St. Lawrence: 1st, Watson, W. G.; 2nd, Oshawa F. G. A.; 3rd, Guthrie, J. B.
Any other desirable variety not named in Class 1: 1st, Norfolk F. G. A.; 2nd, Norfolk F. G. A.; 3rd, Oshawa F. G. A.

Class 3. Dessert Varieties, Plates of Five.

Fameuse: 1st, Watson, W. G.; 2nd, Thompson, Robt.; 3rd, Guthrie, J. B.
Golden Russet: 1st, Brown Bros.; 2nd, Bennett, C. A., Burlington; 3rd, Guthrie, J. B.
King: 1st, Challand, C. W., Marburg; 2nd, Watson, W. G.; 3rd, Brown Bros.
McIntosh: 1st, Stephens, C. L.; 2nd, Michael, J. G., Brooklin; 3rd, Parker, W. C.
Wealthy: 1st, Brown Bros.; 2nd, Guthrie, J. B.; 3rd, Parker, W. C.
Spy: 1st, Challand, C. W.; 2nd, Gilbertson, Jos.; 3rd, Watson, W. G.
Spitzenburg: 1st, Challand, C. W.; 2nd, Thompson, Robt.; 3rd, Watson, W. G.
Any other Variety: 1st, Stevenson, W.H., Oshawa; 2nd, Stephens, C. L.; 3rd, Watson, W. G.

Class 4.—Cooking Varieties, Plates of Five.

Alexander: 1st, Brown Bros.; 2nd, Caston, G.C., Craighurst; 3rd, Guthrie, J. B.
Baldwin: 1st, Challand, C. W.; 2nd, Gilbertson, Jos.; 3rd, Thompson, R.
Blenheim: 1st, Brown Bros.; 2nd, Brown, N. A., Eglinton; 3rd, Guthrie, J. B.
Cayuga: 1st, Johnson, Jas. E.; 2nd, Brown Bros.; 3rd, Parker, W. C.
Greening, R. I.: 1st, Thompson, R. W., Ellesmere; 2nd, Dempsey, W. H.; 3rd, Brown Bros.
King: 1st, Challand, C. W.; 2nd, Gilbertson, Jos.; 3rd, Johnson, Jas. E.
Ribston: 1st, Brown, N. A.; 2nd, Brown Bros.; 3rd, Thomson, R. W.
Spy: 1st, Challand, C. W.; 2nd, Johnson, Jas. E.; 3rd, Gilbertson, Jos.
Any other Variety: 1st, Challand, C. W.; 2nd, Harris, Craig; 3rd, Stainton, W. H.

Class 5.—Cones of Fruit.

Ben Davis: 1st, Oshawa, F. G. A.; 2nd, Caston, G. C.; 3rd, Chatham F. G. A.
Baldwin: 1st, Watson, W. G.; 2nd, Guthrie, J. B.; 3rd, Oshawa F. G. A.
Blenheim: 1st, Brown Bros.; 2nd, Watson, W. G.; 3rd, Oshawa F. G. A.
Gravenstein: 1st, Brown Bros.; 2nd, Guthrie, J. B.; 3rd, Oshawa F. G. A.
Fallawater: 1st, Oshawa F. G. A.; 2nd, Brown Bros.; 3rd, Guthrie, J. B.
Fameuse: 1st, Watson, W. G.; 2nd, Dempsey, W. H.; 3rd, Guthrie, J. B.
King: 1st, Norfolk F. G. A.; 2nd, Watson, W. G.; 3rd, Oshawa F. G. A.
McIntosh: 1st, Oshawa F. G. A.; 2nd, Harkness, A. D.; 3rd, Watson, W. G.
Ontario: 1st, Watson, W. G.; 2nd, Guthrie, J. B.; 3rd, Oshawa F. G. A.
Spy: 1st, Norfolk F. G. A.; 2nd, Guthrie, J. B.; 3rd, Watson, W. G.
Wolf River: 1st, Whyte, David; 2nd, Stephens, C. L.; 3rd, Caston, G. C.

PEARS.

Class 6.—Plates of Five.

Anjou: 1st, Guthrie, J. B.; 2nd, French, Wm. H.; 3rd, Thompson, R.
Bosc: 1st, Smith, A. M.; 2nd, Thompson, R.; 3rd, Read, M. A., Port Dalhousie.
Clairgeau: 1st, Read, M. A.; 2nd, Stewart, F. G.; 3rd, Robertson, G. A.; St. Catharines.
Diel: 1st, Smith, A. M.
Duchess: 1st, Stewart, F. G.; 2nd, Guthrie, J. B.; 3rd, Thompson, R.
Howell: 1st, Smith, A. M.; 2nd, Thompson, R.; 3rd, Delworth, Thos.
Keiffer: 1st, Smith, A. M.; 2nd, Tenbroeck, A. E.; 3rd, Bunting, T. G.
Lawrence: 1st, Stewart, F. G.; 2nd, Peart, A. W.; 3rd, Thompson, R.
Winter Nelis: 1st, Read, M. A.; 2nd, Thompson, R.; 3rd, Stewart, F. G.
Any other Variety: 1st, Smith, A. M.; 2nd, Read, M. A.; 3rd, Smith, A. M.

Class 7.—Export Varieties.

Boxes ready for Shipment (Fruit Wrapped).

Anjou: 1st, Guthrie, J. B.; 2nd, Thompson, R.; 3rd, Stewart, F. G.
Bosc: 1st, Stewart, F. G.; 2nd, Robertson, G. A.; 3rd, Smith, A. M.
Clairgeau: 1st, Robertson, G. A.; 2nd, Stewart, F. G.; 3rd, Thompson, R.
Duchess: 1st, Robertson, G. A.; 2nd, Thompson, R.; 3rd, Stewart, F. G.
Winter Nelis: 1st, Stewart, F. G.; 2nd, Robertson, G. A.; 3rd, Thompson, R.
Kieffer: 1st, Tenbroeck, A. E.; 2nd, Bunting, T. G.; 3rd, Stewart, F. G.
Lawrence: 1st, Thompson, R.; 2nd, Robertson, G. A.; 3rd, Stewart, F. G.

GRAPES.

Class 8.—Plates.

1st, Stewart, F. G.; 2nd, Tenbroeck, A. E.; 3rd, Robertson, G. A.

Concord: 1st, Stewart, F. G.; 2nd, Bunting, T. G.; 3rd, Thompson, R.

Lindley: 1st, Stewart, F. G.; 2nd, Robertson, G. A.; 3rd, Thompson, R.

Niagara: 1st, Bunting, T. G.; 2nd, Stewart, F. G.; 3rd, Tenbroeck, A. E.

Vergennes: 1st, Stewart, F. G.; 2nd, Thompson, R.; 3rd, Robertson, G. A.

Wilder: 1st, Stewart, F. G.; 2nd, Thompson, R.; 3rd, Tenbroeck, A. E.

Any other desirable Variety: 1st, Stewart, F. G.; 2nd, Robertson, G. A.; 3rd, Tenbroeck, A. E.

Best 9 lb. basket Black Grapes: 1st, Bunting, T. G.; 2nd, Robertson, G. A.; 3rd, Stewart, F. G.

Red Grapes: 1st, Stewart, F. G.; 2nd, Thompson, R.; 3rd, Bunting, T. G.

White Grapes: 1st, Bunting, T. G.; 2nd, Stewart, F. G.; 3rd, Robertson, G. A.

Best Fancy Package.

Black Grapes: 1st, Thompson, R.; 2nd, Robertson, G. A.; 3rd, Stewart, F. G.

Red Grapes: 1st, Robertson, G. A.; 2nd, Stewart, F. G.; 3rd, Thompson, R.

White Grapes: 1st, Robertson, G. A.; 2nd, Thompson, R.; 3rd, Stewart, F. G.

Display of fruit in commercial packages exhibited by an Agricultural or Horticultural Society, or Fruit Growers' Association, table space limited to 60 sq. ft. for each exhibit: 1st, Norfolk F. G. A., Simcoe; 2nd, St. Catharines Cold Storage Association, St. Catharines; 3rd, Grantham F. G. A., St. Catharines.

Display of fruit not in commercial packages, exhibited by an Agricultural or Horticultural Society, or Fruit Growers' Association, table space limited to 60 sq. ft. for each exhibit: 1st, St. Catharines Cold Storage Association; 2nd, Grantham F. G. A.; 3rd, Norfolk F. G. A.

Class 9.—Apples.

Display of apples not in commercial packages, exhibited by an Agricultural or Horticultural Society, or Fruit Growers' Association, table space limited to 60 sq. ft. for each exhibit: 1st, Norfolk F. G. A.; 2nd, Oshawa F. G. A.; 3rd, East Simcoe Agricultural Society, Orillia.

PRESERVED FRUIT.

Class 10.—Quart Sealer of Canned Fruit of each of the Following Varieties.

Blackberries: 1st, Tenbroeck, A. E., St. Catharines; 2nd, Guthrie, Mrs. J. B., Dixie.

Cherries, Black and Red: 1st, Depotie, Mrs. P. A., St. Catharines; 2nd, Stewart, Mrs. F. G., Homer; 3rd, Thompson, Mrs. R., St. Catharines.

Cherries, White or Yellow: 1st, Depotie, Mrs. P. A.; 2nd, Stewart, Mrs. F. G.; 3rd, Thompson, Mrs. R.

Gooseberries: 1st, Thompson, Mrs. R.; 2nd, Depotie, Mrs. P. A.; 3rd, Stewart, Mrs. F. G.

Grapes, Black or Red: 1st, Tenbroeck, A. E.; 2nd, Morningstar, S., Goderich; 3rd, Delworth, Mrs. T., Weston.

Peaches (White fleshed): 1st, Stewart, Mrs. F. G.; 2nd, Gregory, Miss E. G., Port Dalhousie; 3rd, Morningstar, S., Goderich.

Peaches (Yellow Fleshed): 1st, Thompson, Mrs. R.; 2nd, Gregory, Miss E. G.; 3rd, Delworth, Mrs. Thos.

Pears: 1st, Delworth, Mrs. T.; 2nd, Thompson, Mrs. R.; 3rd, Depotie, Mrs. P. A.

Plums, Blue or Red: 1st, Delworth, Mrs. T.; 2nd, Depotie, Mrs. P. A.; 3rd, Morningstar, S.

Plums, Green or White: 1st, Stewart, Mrs. F. G.; 2nd, Tenbroeck, A. E.; 3rd, Thompson, Mrs. R.

Raspberries, Red: 1st, Stewart, Mrs. F. G.; 2nd, Thompson, Mrs. R.; 3rd, Emery, Mrs. W. A., Aldershot.

Raspberries, Black: 1st, French, Mrs. W. H., Oshawa; 2nd, Tenbroeck, A. E.

Strawberries: 1st, Depotie, Mrs. P. A.; 2nd, Tenbroeck, A. E.; 3rd, Martin, Miss M. E., 100 Pembroke St., Toronto.

Class 11.—Pint Jar of Jam of each of the Following Varieties.

Currant, Black: 1st, Hilborn, Mrs. J. L., Leamington; 2nd, Depotie, Mrs. P.A.; 3rd, Stewart, Mrs. F. G.

Gooseberry: 1st, Thompson, Mrs. R.; 2nd, Stewart, Mrs. F. G.; 3rd, French, Mrs. W. H.

Grape: 1st, Depotie, Mrs. A. P.; 2nd, Emery, Mrs. W. A.; 3rd, Thompson, Mrs. R.

Peach: 1st, Stewart, Mrs. F. G.; 2nd, Thompson, Mrs. R.; 3rd, Depotie, Mrs. P. A.

Pear: 1st, Thompson, Mrs. R.; 2nd, Stewart, Mrs. F. G.; 3rd, Delworth, Mrs. T.

Plum: 1st, Morningstar, S.; 2nd, Depotie, Mrs. P. A.; 3rd, Sparling, Mrs. J. W., Bowmanville.

Raspberry: 1st, Depotie, Mrs. P. A.; 2nd, Stewart, Mrs. F. G.; 3rd, Thompson, Mrs. R.

Strawberry: 1st, Depotie, Mrs. P. A.; 2nd, Gregory, Miss E. G.; 3rd, Stewart, Mrs. F. G.

Class 12—Half-pint Jar of Jelly of each of the Following Varieties:

Jars or Glasses containing from 7 to 12 oz.

Apple: 1st, Whyte, David; 2nd, Stewart, Mrs. F. G.; 3rd, Hilborn, Mrs. J. L.

Crab Apple: 1st, Whyte, David; 2nd, Depotie, Mrs. P. A.; 3rd, Thompson, Mrs. R.

Currant, Red: 1st, Martin, Miss M. E.; 2nd, Depotie, Mrs. P. A.; 3rd, Delworth, Mrs. T.

Grape: 1st, Depotie, Mrs. P. A.; 2nd, Thompson, Mrs. R.; 3rd, Stewart, Mrs. F. G.

Quince: 1st, Depotie, Mrs. P. A.; 2nd, Stewart, Mrs. F. G.; 3rd, Thompson, Mrs. R.

Raspberry, Red: 1st, Depotie, Mrs. P. A.; 2nd, Sparling, Mrs. J. W.; 3rd, Thompson, Mrs. R.

Class 13.—Grape Juice.

Grape Juice, unfermented, one quart bottle: 1st, Sparling, Mrs. J. W.; 2nd, Stewart, Mrs. F. G.; 3rd, Thompson, Mrs. R.

FOURTH ANNUAL REPORT

OF THE

ONTARIO

Vegetable Growers' Association

1908.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.

TORONTO:
Printed and Published by L. K. CAMERON, Printer to the King's Most Excellent Majesty.
1909

WARWICK BROS' & RUTTER, Limited, Printers,
TORONTO.

To the Honourable John Morison Gibson, K.C., LLD., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

May it Please Your Honour:

I herewith present for the consideration of your Honour the Annual Report of the Ontario Vegetable Growers' Association for 1908.

Respectfully yours,

J. S. DUFF,

Minister of Agriculture.

Toronto, 1909.

Ontario Vegetable Growers' Association.

OFFICERS, 1909.

President: Thos. Delworth, Weston.

1st Vice President: F. G. Fuller, London.

2nd Vice President: Wm. Parsons, Sarnia.

Secretary-Treasurer: J. Lockie Wilson, Toronto.

Executive Committee: T. Delworth, Weston; R. H Lewis, Hamilton; F. F. Reeves, Humber Bay; J. Lockie Wilson, Toronto.

Directors: R. H. Lewis, Hamilton; E. J. Mahony, Hamilton; J. Dugal, Tecumseh; R. J. Bushell, Kingston; J. N. Watts, Portsmouth; W. W. Weaver, Chatham; S. Ferguson, Ottawa; A. L. Lafferty, Ojibwa; F. G. Fuller, London; C. W. Baker, Woodbank; Wm. Parsons, Sarnia; H. J. Sharpley, Bracondale; F. F. Reeves, Humber Bay; J. W. Rush, Humber Bay; Jas. Dandridge, Humber Bay; Thos. Delworth, Weston.

Representatives to Ontario Horticultural Exhibition: E. J. Mahony, Hamilton; F. F. Reeves, Humber Bay; Thos. Delworth, Weston; H. J. Sharpley, Bracondale.

Representative to Nomenclature Committee of Ontario Horticultural Exhibition: Thos. Delworth, Weston.

FINANCIAL STATEMENT.

Receipts.

Dec. 1, 1907....Balance on hand from last year		$267 69
Subscriptions to *Horticulturist*		88 50
April 28, 1908...Government grant		800 00
Interest		75
Total		$1,156 94

Expenditure.

Subscriptions to *Canadian Horticulturist* at 50 cents each	$85 50
Secretary's salary, 1907	50 00
Services at Horticultural Exhibition, 1907	15 00
Postage and stationery	28 05
W. C. Coo, reporting Convention, 1907	45 00
T. F. Gorman, Montreal, addressing Annual Convention, 1907	22 15
Prizes (for report on work, 3 prizes $30; for membership, 3 prizes $30)	60 00
Seed for Onion Competition	10 10
Printing (letter heads, badges, programmes)	34 00
Books	3 19
Crop report for *Horticulturist*, 1907	37 01
A. McMeans, Onion Investigation, Scotland	3 55
Investigation *re* work at Jordan Harbor and Guelph	35 60
Grants to branch associations for picnics	10 00
Grants to Ontario Horticultural Exhibition (December 2nd, 1907, $100; December 17th, 1907, $50.17	150 17
Membership Fee, Ontario Horticultural Exhibition, 1908	5 00
Advertising in Ontario Horticultural prize list, 1908	11 00
Executive meetings (Mar. 10, 20, Apr. 8, 21, July 21, Oct. 19, Nov. 11)	14 15
Convention expenses, 1907	30 30
Expenses of annual meeting, February, 1908	47 30
Directors' meeting, September, 1908	70 00
Convention expenses, November, 1908	81 40
Sundries (Minute book, duty on books, etc.)	5 00
Balance on hand November 30, 1908	303 47
	$1,156 94

J. Lockie Wilson,
Secretary-Treasurer.

Audited and found correct,
W. G. Lindsay.

Ontario Vegetable Growers' Association.

FOURTH ANNUAL CONVENTION.

The fourth annual Convention of the Ontario Vegetable Growers' Association was held in the City Hall, Toronto, on Thursday, November 12th, 1908. This was, without doubt, the largest and most enthusiastic gathering of Vegetable Growers that the Association has ever held. The addresses, papers read, and the discussions thereon, were of a high order, and interest was maintained throughout. The President, R. H. Lewis, occupied the chair.

PRESIDENT'S ADDRESS.

By R. H. Lewis, Hamilton.

I am pleased to see such a large gathering present from the different branches representing vegetable growers from different sections of the Province. The first item on the programme at the first session is the President's address. As I am a man of few words, I shall just touch on a few points connected with the work that has been carried on during the past year.

This convention is mainly for the purpose of educational work, interchange of ideas and comparing of experiences. By these methods we improve not only ourselves but also the community of which we form such an important part. The secretary's report will bring out all the different matters we desire to take up. I propose to mention as briefly as I can a few of the things we ought to take in hand during the coming year. Last year we inaugurated a new departure in our Association along the line of experimental work in vegetable growing, and the results, notwithstanding a bad season, were of educational value to our members. This will be fully discussed later on by those who took part in these experiments. For new work, I think we had better take up during the coming year the organization of different branches, and strengthening of weaker ones. At the Executive meeting last evening we recommended that a motion be passed to send delegates and speakers to the different branches during the winter. Branches requiring speakers may communicate with Mr. Lockie Wilson, who will do what he can to send out experts to deal with the requirements of the different localities. Pure seed was the subject of frequent discussions at our Executive meetings during the year. You will receive our report in this connection later on. Your Executive paid a visit to the Guelph Agricultural College and also Jordan Experimental Station. I was very much surprised to find things in such fine condition at the Experimental Farm. The vegetable growing is in a different shape from what it was two years ago. We found everything in good order, and Mr. McMeans, the vegetable growers' representative at the College, very kindly showed us around and explained the different seeds that had been planted for experimental purposes. I was particularly interested in their tomatoes. They are much farther north than

the Niagara District, and yet I found an enormous crop of early ones far ahead of anything we usually have. The late tomatoes were a very poor crop. We think the proper place to experiment with them is at Jordan Station, where the land is more suitable for such experimental work, and would be more like the eastern part of the Province. We found the vegetable garden was kept well, and everything up-to-date, and a credit to Mr. McMeans.

I will not say anything of the Jordan Station at present because we shall have a report on that by the Executive Committee, and also one on the onion question by Mr. McMeans. He was sent out for the purpose of making a report and getting data, and I think he visited twelve different States of the Union.

With regard to the present season. You are all aware that prices in general in the Province have not been as high as they were a year ago. We ought to have a larger duty on vegetables. The Toronto market is flooded every spring with cabbages and early vegetables, and this prevents the Ontario growers from getting better prices. The moment these shipments of their surplus stock are stopped, our Canadian-grown vegetables go up in price, and if those from the United States are allowed to come in our prices have to come down. Every one understands that these early vegetables are luxuries, purchased only by the wealthier classes, and we are of opinion that if we were given the same protection as the American growers have, we would be encouraged to produce these earlier varieties, and the money paid therefor would be distributed among our own tillers of the soil. This year everything has been down, but, nevertheless, it has been a fair season for the market gardener all through. Crops have been good, except tomatoes, which were generally light. This question has been a very predominating one for the last five or six years. I am glad to say that the majority of canning factories through the country have raised the prices from 25 to 27½ cents per bushel. I understand that here in Toronto they only pay 25 cents. I do not know whether that is on account of the goods not being up-to-date or not. In the Hamilton District and St. Catharines they paid 27½ cents. I am satisfied that they see the necessity of raising prices, so that it will be a paying proposition for gardeners. I will not take up any more of your time because interesting papers on the subjects mentioned will come up for your consideration. I thank you for your kind attention, and know that we shall have a pleasant and profitable meeting.

T. Delworth: The chairman has given us an outline of some of the work we have attempted during the year. If we are going to accomplish anything we must be enthusiastic about it. I have very little use for a man who is not enthusiastic about something, no matter what it is. One secret of the success of this Association is that the officers have thrown themselves into the work, and as long as that is done we shall continue the upward climb.

With regard to the work for the future, this year we decided to conduct a series of experiments in onion growing to determine if possible the best dates for seeding. With that end in view, a quantity of seed of two leading varieties was procured from Toronto seedsmen and samples were sent to twelve different growers situated in various parts of the Province, and we have reports of the experiments from them. Around Toronto and most of our cities we are in the habit of sowing onions as early in the spring as we can get the ground in proper shape. A party from the onion-growing section of Brant County informed us that their practice was to have a later seeding. By this means they cleared out the first crop of weeds and got a quicker germination because the ground was warmer when the seed was put

in it. That was very much opposed to our general practice, and we thought it was well worth a test, and these seeds were procured with that end in view. Arrangements were made to have those crops inspected, but, unfortunately, this was not carried out. Two varieties, Golden Globe and Yellow Globe Danvers, were selected. So far as I have been able to determine by watching the crop, I can see no real difference in the two varieties. That was not the primary object of the experiment. In carrying out the plan proposed I sowed fifty feet of each variety on each date of seeding. That made 100 feet of row altogether. The seed was sown on three different dates, 6th, 16th and 30th of May. From the first I harvested 142 pounds of marketable onions and from the second, ten days later, 130 pounds. From the third seeding, fourteen days later than that, again I harvested 32 pounds and five pounds of culls. There were no culls whatever from the first seeding; there was one pound from the second. My report is fairly typical of the whole. As the full returns of these experiments will be published in our annual report, I will not make any further reference to them here.

H. S. Peart: I was asked by the Committee of the Vegetable Growers' Association to visit these crops. At that time it appeared as though I would be able to do so. I had some inspecting to do in connection with fruit work in the Province, and in looking over the list of names I saw that many of the places were close together. Unfortunately, owing to working at the new Jordan Station, I was unable to get away during the early part of the season, and the visit to the fruit stations was so late that some of the onion crops were harvested before I could get there. However, I did see some of them at a few points. With one exception those that I saw will bear out what the previous speaker has said. The first sowing appeared to be most satisfactory. One or two of the growers told me that the seed arrived so late that their onions were up several inches and they did not think it worth while sowing. It is a big job to get experiment seed out in time. It is so late in the spring before we know what our grant is going to be. Of course, this farm, where I made the experiment, has been a grain farm and the previous crop was oats and there was no manure put on it. We had only 50 feet of a row of Golden Globe, and we got 27½ pounds, and of Yellow Globe Danvers 46½. From those sown on the 15th of May, ten days later, we got 29 pounds of Golden Globe and 24 of Yellow Globe Danvers. From the third, sown 13 days later, on May 28, the Golden Globe gave us 29, and the Yellow Danvers 22 pounds. You will, therefore, see that our second and third sowings were practically alike. The first sowing of Yellow Globe Danvers was equal to any two others. The seed was sown exactly in the same way. When we came to take the bulbs up we found the Golden Globe firm in every case, but the Yellow Globe was rather soft. We had no thick necks and there was very little difference in the color.

I visited several sections where the onions were not harvested and I saw in Leamington some wonderful fall crops of them. In the Georgian Bay District the seed arrived very much later and therefore the crop could not be compared with the others.

T. Delworth: With regard to work in the future, I am confident that it will be important to repeat these experiments. Another vegetable we should take up is the cauliflower. We get most of our seeds from Europe, and we pay a high price for it. We hope this year to obtain a small quantity of Ontario-grown seed, and send it out with others for experimental purposes. We asked for suggestions for experiments that you think might be useful. If you will write to Mr. J. Lockie Wilson at any time he will be pleased to take up any that you may suggest.

At a meeting of the directors held last night we considered one or two changes that we thought might be made in our organization which are as follows, and I trust they will meet with the approval and endorsation of this meeting:

"That it would be in the interests of our organization that that portion of the Constitution, viz., clause 3, be changed to read, "fifty cents per member instead of one dollar;" and that it be hereby changed, and that the amendment go into effect immediately after the Annual Convention. That out of such membership fee of fifty cents the sum of ten cents be forwarded by the branches to the Central Association, and that clause 22 be changed to read fifty cents per annum instead of one dollar, and that the portion of clause 22 that refers to the official organ be changed to make the subscription to a paper optional with the individual members. Carried, subject to ratification by the Annual Convention to be held on the 12th instant. The Directors are unanimously of the opinion that it would be in the best interests of individual members to continue as subscribers to *The Horticulturist*."

The report was adopted.

J. W. Rush: As one of the experimenters selected, I tested some onions. I set 22 rows, 225 feet long; they were sown on May 6th. They came up evenly. I sowed again on May 15th and 28th. Those on the 15th grew much larger than those sown on the 6th. Those sown on the 28th were almost a failure; they came up thin and small.

I usually plant about the first week in May, which is the best time for this vicinity. I had no thick necks.

W. W. Weaver: There are some onions sown in our district. In Kent we usually sow from the first to the tenth of March, and we consider it is late if we plant in April. When the seed arrived for the test our onions were two inches high, and the ground had become so dry that the seed would not germinate. Only half of it grew. In the second sowing not enough came up to make any showing at all, and the third lot was not put in. If the experiments are to be continued, it would be almost useless to sow at so late a date.

J. A. Farquharson: It was May 16th before I could sow anything, and I only made two sowings. The first on the 16th of May and the second on June 16th, and from 150 feet I only got 100 pounds of both varieties. The first sowing of Golden Globe was the best. I noticed very little difference in firmness.

T. Delworth: The conclusions we must all come to, so far as this year's test is concerned, is that early sowing is the best. I have here the report of the first visit made to the Guelph Agricultural College and to Jordan Harbor, which I will read:

To the Directors of The Ontario Vegetable Growers' Association.

Your Committee visited the Ontario Agricultural College, Guelph, on August 5th, for the purpose of looking over the work being done there of interest to vegetable growers. Messrs. Crow and McMeans of the Horticultural Department took us around the grounds and explained the work. We found the College garden and vegetable experimental plots very well kept. We were pleased with some experiments in the Seed Section, particularly in tomatoes and peas. We would advise that this work be continued with these vegetables for several years, in order, if possible, to fix improved strains, and, when this has been done, that some means be found for distributing them to prevent the labor being lost.

We also visited the Experimental Station at Jordan Harbor on August 20th, where Mr. Peart, the Director, very kindly showed us over the grounds. Considering that this place has only been devoted to its present use for two years, we consider the work to be making excellent progress. We were also agreeably surprised with the soil, much of which we consider well adapted to vegetable growing. We were shown some very interesting experiments in onions, corn and other vegetables, reports of which we understand will reach you in the annual report of the Station.

One of the greatest drawbacks to the place is its inaccessibility. In order to do the good that it is capable of doing it should be made easily accessible to those interested in its work residing in other parts of the Province. If a station were located on the G. T. R., at the Vineland crossing, some at least of this difficulty would be overcome

Respectfully submitted,

Signed,

R. H. Lewis.
T. Delworth.
F. F. Reeves.

F. F. Reeves: There has been a suggestion made to the Executive that we take into consideration in future the advisability of using a portion of our funds for distribution of new seeds or new varieties for testing purposes, and as an inducement for vegetable growers to enter the Association and become members. We must have some new lines of work. The fee has now dropped to 50 cents, and that will increase membership 100 per cent. We must offer some inducement to gardeners to get them to come into the Association.

The Report of the Executive Committee was then adopted.

REPORT OF SECRETARY-TREASURER, J. LOCKIE WILSON, TORONTO.

A year ago you did me the honor of electing me Secretary-Treasurer of your organization, and in the interval I am gradually becoming initiated into the mysteries of scientific vegetable growing. Yours is an industry that is as ancient as those hills which took form out of chaos when the mandate came, "Let there be light," when our forefathers entered into copartnership with sunlight, earth and air, and before the first suit of fig-leaves was utilized to cover naked humanity.

At first, man lived the truly healthful life, peacefully enjoying the products of his garden, and desiring no other food or luxuries than these, and long life was the result. But gradually, as man developed a liking for the flesh of animals, he became vicious and warlike, and a desire to kill took possession of his soul, which resulted in the shortening of his years. That was an evil time for humanity. But, as the ages have passed, a fairer day has dawned, the cry is back to the simple life, and the vegetarian has moved to the front with rapid strides. In consequence, the death rate has been lowered, and color has come back to the cheeks, and healthful blood courses through the veins of the sons of men. More power to the vegetarian in his efforts. The producers of earth's richest products are with him, heart and hand, and are prepared to supply in unlimited quantities the vegetables without which the human race would become enervated, sicken and die.

In the growing of vegetables the day is past when all that was necessary was to tickle the ground with a spade, throw in some seed and get good results. The nature of soils must be understood, the kind of vegetables best adapted for each variety of land ascertained, the best methods of fighting insects and fungous foes studied, and a knowledge gained of the fertilizers best adapted for the various kinds of soils. In this connection the Experimental Farms and Stations are of untold value to our Association and to individual vegetable growers. Scientific plant-breeding is gradually evolving higher types of garden products of better quality, more juicy and succulent, and the types with larger quantities of woody fibre are now being fed

to stock, while the gardener who still produces these coarser kinds must be satisfied with smaller financial returns. As the wealth of our cities increases, the demand grows for the finer qualities of your food products.

It may be of interest to the members to learn something of the work undertaken during the past year. In brief it is as follows:

Realizing the importance to the vegetable grower of being able to procure first-class seed of the kind he is desirous of sowing, we have had some correspondence with the Department at Ottawa in reference to a delegation waiting on the Dominion Minister of Agriculture with a view to securing such amendments to the Seed Act as would protect the vegetable growers from seed, poor in vitality and untrue to name. Owing to various circumstances, it was decided that the delegates should go later. Mr. Delworth, while in Ottawa, had a talk with the Deputy Minister of Agriculture, and, as a result, he recommends that this Association endeavor to secure legislation to counteract the non-warranty clause used by seedsmen on their seed packages and catalogues, in so far as they may reasonably be expected to assume responsibility. Also that an Act be passed penalizing seed merchants who sell or offer for sale seeds which fall below, say 60 per cent. of vitality, unless the percentage is plainly stated on the package. Also that, in some way, encouragement be extended to growers of garden seeds in Canada, when such are produced under approved regulation and proper inspection of crop. During the year a number of books have been purchased treating on the culture of beans, asparagus, tomatoes, potatoes, rhubarb, mushrooms, cabbages, and cauliflowers. These are at the services of the directors and members at any time in connection with lectures and addresses to branch Associations.

The Executive committee waited on Mr. C. C. James, Deputy Minister of Agriculture, to see if arrangements could be made to ascertain the amount of money invested in hot house sash and greenhouses in the Province. This matter was left in abeyance for the present, but the Department arranged to send out a couple of gentlemen to report on onion and tomato growing. Mr. McMeans was deputed to investigate for us the former industry in the United States and Canada, while Mr. Turney took the other. These gentlemen will give you extended reports on these important garden products. Efforts are being made to establish a branch Association at Dunnville, and I am in hopes that a strong organization will be formed there. There are now nine branches in existence, with a membership running up into the hundreds.

Donations of $5 in cash were this year given to branch Associations, which held picnics, the officials being allowed to give whatever prizes they wished with this amount. London, Hamilton, and Ojibwa were the only branches that held picnics this year which reported to me.

Mr. H. S. Peart was selected to judge the reports of the branch Associations for 1907, for which prizes were offered. The first prize was awarded to F. F. Reeves, Humber Bay; second to Thos. Tregunno, Bartonville; and third to J. N. Watts, Portsmouth.

Mr. Peart was also asked to act as inspector of the experimental plots, the experimenters in which were Smart Bros., Collingwood; J. Watts, Portsmouth; A. F. Smith, Scotland; T. Delworth, Weston; F. F. Reeves, Humber Bay; Campbell Bros., Leamington; Thos. Tregunno, Bartonville; F. Collins, Chatham; F. Whitehall, London West; I. A. Farquharson, Ottawa; A. McMeans, O.A.C., Guelph; H. S. Peart, Jordan Harbor; and Prof. Macoun, C.E.F., Ottawa.

Two varieties of onions, Yellow Danvers and Golden Globe, were selected. There were to be three dates of seeding, and 50 feet of each variety to be sown each time. The total size of the plot to be 100 feet of row. Each experimenter was furnished with seed of the above named varieties and is allowed $2.00 for a report of the work done. These reports will doubtless be placed before you to-day.

A motion was passed requesting the Department of Agriculture to conduct Seed Laboratory testing with the principal varieties of vegetables, the seed to be purchased in the open market from leading Canadian and American seedsmen, and the work to be done as early as possible in the year, and results published before planting time. In this connection I received the following reply from Prof. Day:

I have your favor of the 13th instant., addressed to President Creelman, and giving notice of a motion passed by the Vegetable Growers' Association. I must confess that I am not exactly sure what this motion implies. It seems to me that it would be a pretty large undertaking, on the face of it, to attempt testing all varieties of seeds from all the leading Canadian and American seedsmen. It would require special equipment for the purpose and possibly the employment of additional help. As I understand the meaning of the motion, it would be out of the question to undertake work along this line for the present season; so that I shall have your letter placed on file for the perusal of the President upon his return.

(Signed) G. E. Day,
Acting President.

At the Executive meeting held on October 19th, Mr. Delworth was appointed as representative of this Association on the Nomenclature Committee of the Ontario Horticultural Association.

During the year your Directors held three meetings and the Executive seven.

I cannot close this report without expressing to the President, Mr. R. H. Lewis, and the Directors, my hearty appreciation of the excellent service and co-operation rendered by them during the year that has just closed. I would urge all the members if they desire to make this organization the success it should be to put more energy into the work of extending the branches. It has been truly said that in union there is strength, but we also require numbers to make our work as effective as it should be.

The Directors unanimously approved of the proposition that in order to encourage the work and to assist you we thought it better to reduce the price of membership from $1 to 50c. This will add largely to the membership all over the Province, and you will have more power and more influence, and be of more use to the community in which you live. I thank you for the very kind hearing you have given me. I trust that the incoming year may be a successful one, and that the new Directors will be men who are prepared, not only to accept the honor conferred upon them by the local branches, but will do their utmost for the work they have in hand; and that each and every one of you will go back to your homes and will get out into the highways and byways and compel the men who are standing back to come forward and become members of the Ontario Vegetable Growers' Association, and help you to make this magnificent Province, of which we are all integral parts, to flourish more than ever before.

T. Delworth: I want to refer briefly to the question our Secretary has mentioned, of seed. I would like every member of our Association to understand what we are asking for. The Executive are doing their very best for every individual member of the Association, and will welcome suggestions and criticisms. We have in Canada what is known as the "Pure Seed Act;"

it primarily protects the farmer buying clover seed. Under that Act a seedsman selling clover seed has to guarantee the percentage of germinable seeds in the sample, and has also to guarantee that it is fairly free from weeds. The percentage of weeds allowed is three to the thousand, and of germination 85 per cent. If he supplies No. 2 seed it has to be branded "No. 2." Clover seed is worth $10 or $12 a bushel, but we pay $2 to $3 an ounce for cauliflower seed, and have no guarantee whatever given with it. It may contain 10 per cent. or 100 per cent. of cauliflower seed, and none of it may germinate. On the outside of the package there is a declaration used practically by all seedsmen, disclaiming any responsibility for the seed, from any cause whatever, and if the purchaser is not satisfied with those conditions he may return it at once. I do not see why seedsmen should not be compelled to guarantee vegetable seeds. They are much more valuable, and so is the crop. We are not asking for cheaper seeds; it would be very much better to pay more for them if we could be sure of their vitality and trueness to type.

There are two things we are suffering from in seeds, viz.: lack of vitality and variation from type. Some two years ago we had onion seed that gave us onions untrue to type, and some seasons there is a lot of seed sent out that is low in germination. The man who buys seed of that kind would be all right if he knew the percentage, because he would simply have to sow a little thicker, but the man who buys seed untrue to type cannot do anything. The seedsmen say that some years it is impossible to furnish seed that will give the full percentage of germination. If that is the case let them print on the package the percentage of seed that will germinate, and then the buyer will not be injured and he can regulate his seed accordingly. If I buy cauliflower seed at $3 an ounce and get Kale seed, as a neighbor of mine did, worth 30 cents an ounce, and have no redress, that is a pretty bad state of affairs.

I want to point out the relation between the cost of seed to a crop. Onion seed is sown five pounds to the acre, and is worth from $1.50 to $2 a pound. I have had 860 bushels to the acre and they are worth on the market this year 50 cents a bushel. They are a very expensive crop to grow, and if I sow seed of which only 50 per cent. germinates it does not pay. A thin seeding has a tendency to produce thick necks, and you do not harvest as good a quality of bulbs as you do from very thick seeding, and you have just as much expense cultivating a light crop as a large one. Some of these seedsmen advertise that they have been in business 50 years and longer, and we have a perfect right to expect that after 50 years of experience they will know the proper source of supply for seed every year in Canada. We do not know where they get their seed, but they should use their knowledge to protect their customers. We do not want to do anything underhand, nor have any undue advantage from the Government or anybody else, but as citizens we ask for protection. The Pure Seed Act was some time getting through the House on account of the lobby that was put up against it. We claim that we are entitled to the same protection, and that the Act should be extended to as to cover vegetable seeds.

THE PRESIDENT: Nobody but a Scotchman could get that report up in such beautiful language that explains itself. Of course we are aware that Mr. Wilson is fully capable for the position and is well able to make out a good report. It is a very excellent one, and Mr. Delworth has added his comment on the seed question, which has been a burning one with him for some years, and I am glad he has expressed himself on that question to-day.

The Secretary's Report was then adopted.

ONIONS.

By A. McMeans, O.A.C., Guelph.

Early in the year 1908, the Executive of the Ontario Vegetable Growers' Association requested the Department of Agriculture to have an investigation made into the extent and nature of onion growing in Ontario, and a report prepared upon the same.

I was instructed by the Minister to do this work, and was authorized to visit the principal onion producing States, to enquire into the methods there pursued. During the months of August and September, I visited the onion growing sections in the States of Michigan, Indiana, Illinois, and Ohio.

I beg to submit herewith my report, which I trust will be of some help to the onion growers of this Province, in helping them in some measure to produce larger and better crops, and which will assist in increasing their profits in this important business.

The American onion markets are supplied as follows:—In April, Egyptian onions make their appearance, an average of over 83,000 bushels having been imported annually during the past five years. These are followed by the Bermuda, and the Texas crop of Bermuda onions, which are marketed in crates. The crop in the State of Texas last year was over 2,000 cars. The Southern Texas Truck Growers' Association control over ninety per cent. of the shipments. The Bermuda onion does not last long nor keep well, and is out of the market before the northern grown crop is ready, so they are followed by the Louisville, Ky., onion. A large section in that locality is devoted to this line. They are all grown from sets, and supply the markets for two or three weeks, until the northern crop comes in. This is harvested in August and September and marketed during fall and winter. The Spanish onion, both the Denias and Valencias, compete against the domestic onion of the northern States during the fall and winter. During the year 1908, 214,430 crates of Denias were imported.

The following information was furnished me by the Bureau of Statistics of the United States Department of Agriculture. The latest federal statistics of onion production in the United States are those relating to the crop of 1908, and according to the census amounted to 11,790,974 bushels from an area of 47,983 acres, an average of about 266 bushels per acre. The principal producing States were as follows:—

State.	Acres.	Bushels.	State.	Acres.	Bushels.
New York	6,033	2,177,271	Connecticut	1,206	422,591
Ohio	5,067	1,677,442	Pennsylvania	1,506	347,806
Michigan	2,611	783,948	Wisconsin	1,230	331,662
Massachusetts	1,670	748,309	Kentucky	1,705	305,113
Illinois	2,563	546,681	Iowa	1,195	292,097
California	2,207	514,859	Missouri	1,383	259,272
Indiana	2,105	505,010			

The following also was furnished:

Imports of domestic onions from, and exports to Canada.

Year ended June 30.	Imports.	Exports, domestic.
	Bushels.	Bushels.
1904	2,103	78,886
1905	2,137	118,920
1906	520	39,600
1907	641	81,585

Soil. A profitable crop of onions can be grown on almost any soil, provided that it is well drained and fertilized, and has an abundance of humus in it. The land should be free from stones and rubbish, also from foul weeds and weed seeds, as any one of these will add heavily to the expense account.

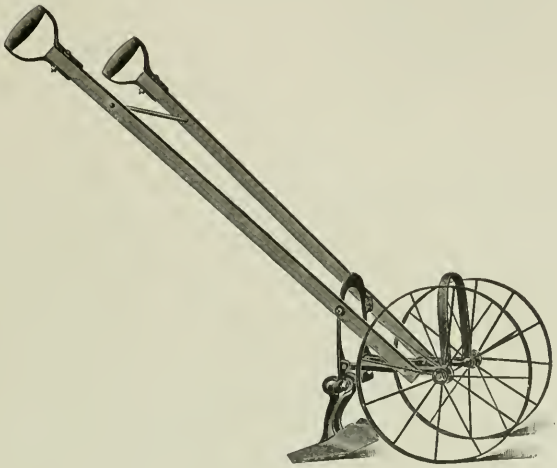
Hand Cultivating.

All of the onion growing sections visited, with the exception of the Lake Ashtabula section in Ohio, were on soil with muck varying from two to thirty feet in depth, depending on the locality, with subsoils ranging from sand to clay loam, and is one of the oldest, if not the oldest, onion growing sections in the States.

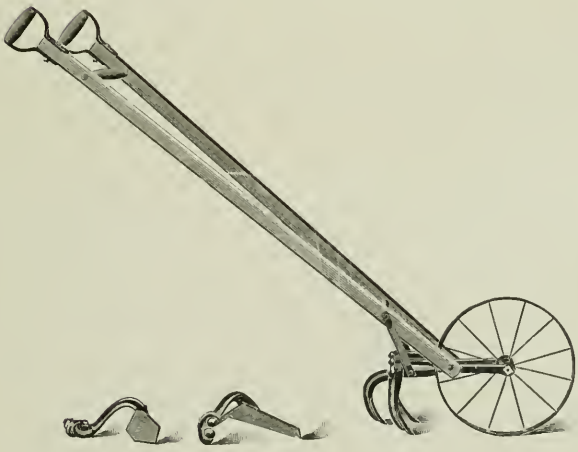
Manure. Many of the commercial onion growers on muck soils do not use manure at all, depending on commercial fertilizers for their crop, applying it at the rate of from 800 to 1,200 pounds per acre. Their chief objection to stable manure is that it contains too many weed seeds. Other growers like to apply manure about once every three years at the rate of about twenty tons per acre, believing that the bacteria which are at work in the manure give life to the inert vegetable matter that is in the soil. They also supplement the manure with a commercial fertilizer composed of potash and phosphoric acid, about eight to ten per cent. of each. Other growers like to get the crop of onions off the ground by the first of September, sowing oats, which are plowed under late in the fall, for the purpose of adding humus to the soil.

The onion growers situated on upland apply manure when it can be secured profitably, at the rate of forty or fifty-two horse loads per acre. The general tendency is not to use so much stable manure, fifteen to twenty tons per acre being deemed sufficient, to which is added five hundred pounds of fertilizer.

Where stable manure is used, it is generally applied in the fall and plowed in, although some prefer to plow the land in the fall and apply well rotted manure in the spring, working it in with a disc harrow.



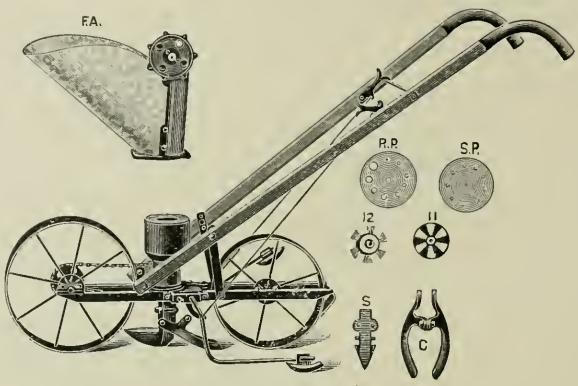
Cultivator.



Cultivator.

Where fall plowing is practised, the following is generally the rule: As early in the spring as the ground will carry a team, it is harrowed with a drag, which helps to dry the surface. A few days later it is disced and thoroughly pulverized. It is then harrowed. The fertilizer is then applied, usually with a drill, so as to get even distribution, after which the ground is again harrowed and planked, leaving a smooth, even surface, free from lumps and ready to receive the seed.

Seed. A goodly number of the growers test their seed for germination and sow their seed accordingly, generally using from four to four and one-half pounds per acre on muck soils, and on upland from four and one-half to five pounds of seed per acre. The exception to the above is in the case of white seed, which is generally sown at the rate of about six pounds per acre. The desired type of white onion is a little larger than a hen's egg, hence the heavier seeding of white.



Seed Drill.

The Iron King seed drill is used almost exclusively, some large fields of twenty to thirty acres sown with drills, one man easily sowing an acre per day, the rows being from twelve to thirteen inches apart.

Some of the very large growers use an ingenious arrangement of their own, attaching from five to seven drills together, and using a horse for motive power, having a boy to lead the horse and a man to watch and guide the drills.

Sowing the Seed.

Weeding. The fight against weeds commences just as soon as the young onion plants appear above the ground. In fact, some of the growers do not wait for the plants to appear, but use a weeder about four feet in width built on the principle of the Breed or Hallock weeder. This weeder is attached to a wheel hoe and they go over the onion field across the rows

just before the young plants appear. This tool serves a double purpose—it kills innumerable small weeds just starting and leaves a dust mulch on the soil, conserving moisture. This is followed by the wheel-hoe, which is generally used from five to eight times during the season, at a cost of about $1 per acre for each hoeing. Both single and double wheel-hoes are used. Planet Jr., Iron King, Iron Age, and other makes of implements are used, some preferring one and some another. Some growers, not satisfied with any one of the machines on the market, use one of their own construction.

In growing red or white stock, at the time of the last wheel-hoeing, the hoes in the implement are changed or taken out altogether and teeth substituted, so as to throw up some soil on the onion bulb to protect it from the rays of the sun, and by so doing secure a better colored onion. The small weeds in the rows of plants that have been left by the wheel-hoes are removed by hand. For this purpose, boys and men are chiefly employed, and the

Wheel Hoeing.

field is generally gone over three times in a season, at a cost of from $10 to $25 per acre for hand weeding.

Harvesting. During the latter part of August or the early part of September, depending on the locality, the onion tops start to die down; as soon as tops are about half down and the root "lets go" of the soil, harvesting commences.

The methods employed, especially on red and white stock, is to pull six or eight rows and place in a windrow. Two men or boys take three or four rows each, pulling the onions by the tops in handfulls and placing them in the windrow between them, in such a manner that the bulb of the onion rests on the soil, while the half-green tops cover the bulbs of the preceding bunch, the object being to keep the onions from the sun to preserve colour. It also serves to produce a milder onion. With the Yellow Globes, the same particular care is not used. After lying in the windrow four or five days, they are topped by hand, slatted crates holding about a bushel apiece having previously been distributed throughout the field. The onion toppers mostly use a pair of sheep shears, although some prefer to use a knife.

After the onion is topped it is dropped into one of the slatted crates. When full, these are piled one on top of the other about four high, and a bunch of the onion tops placed on the top crate to protect the onions in that crate

Pulling Onions.

Topping Onions by Hand.

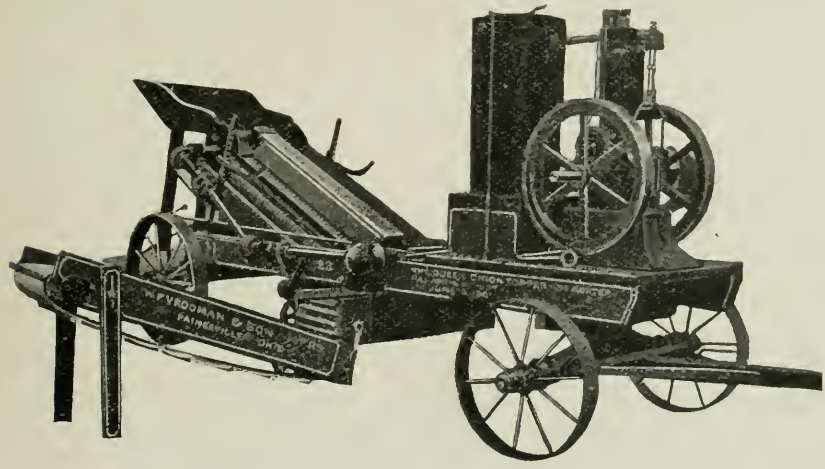
Crates of Onions in Field Ready for Topping.

from the sun. They are then left in the field to cure, or are removed from the field without piling and taken to open sheds to cure. The hand toppers are paid from two to three cents per bushel for topping, and they leave slightly more top on the onion than is the custom in Ontario.

Where a machine is used for topping, the onions are left in the windrow a few days longer; they are then gathered up tops and all into crates, and these piled up in the field four high and in some cases ten or twelve in length, and covered with boards to protect them from the weather, and left until all the crop is ready. Teams are then used to draw the crates

Crates of Onions Curing in Field.

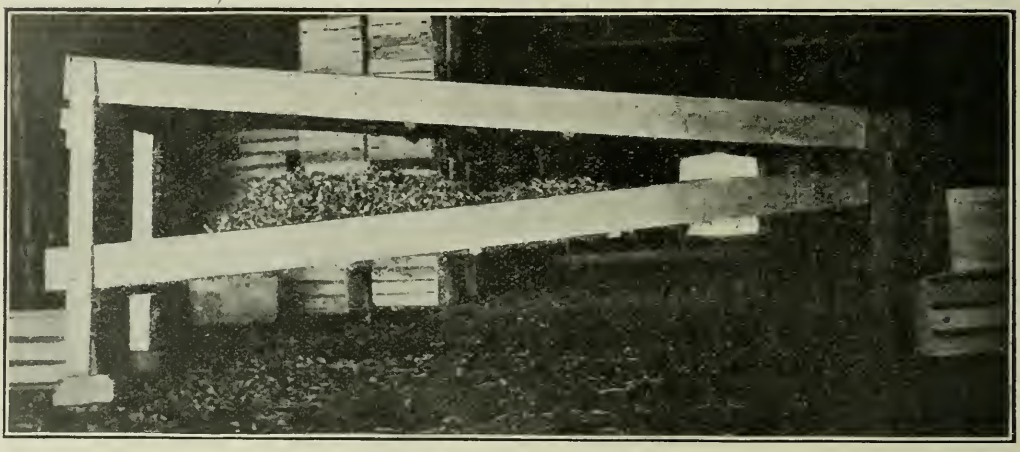
of onions to the topping machine, which is set up near the storage house. The latest improved topper is mounted on trucks and in many cases is taken to the field and used there, moving from one pile of onions to another, as no time is lost in setting up the machine. These topping machines pinch the top of the onion off by means of a square cutter bar, in such a manner that the length of the stem remaining on the onion is in proportion to the size of it, and never is an onion topped too short. After passing down the rolls of the machine, the onion drops on a travelling slatted screen to remove all small ones, dirt, etc., then the onion drops on an endless travelling belt, where the sorting takes place. All damaged, unsound, or "thickneck" onions being removed by a man or boy stationed there for the purpose, the good onions dropping into crates at the end of the carriers.



Onion Topper.

These machines are built in three sizes, one, two and four rolls, each roll being supposed to be capable of topping forty to fifty bushels of onions per hour.

The onions that have been topped by hand, after they are thoroughly cured and are ready to be moved to market or storage, are run over screens to remove all small ones and loose skin on the onion. The ideal screen (the one in use in Hardin County, Ohio) is 36 inches wide, 10 feet long with an apron of 14 inches and narrowing in to a mouth of 15 inches in width, 44 inches high at the top or high end of the screen, 37 inches high at the low end or mouth of the screen, and the sides are six inches in height. The screen proper is made of hardwood slats spaced one and a quarter inches apart. These have rounded tops so as not to damage the onions when passing over them. They are one and one-half inches deep, 7-8 inch wide at the top and 5-8 inch wide at the bottom, so that once an onion starts to go through it has a clear passage. The screen proper is removable and can have other sizes used in the same frame, as some growers use one and one-eighth inch and others one and one-quarter inch screens. For white onions a one-inch screen is nearly always used. It takes six men to properly operate the above, one man to dump the onions on the screen, another to take them away, and two on each side to work the onions over the screens from one



Onion Screen.

side to the other, always pushing them down towards the mouth of the screen, picking out all damaged and unsound ones. Six men will screen one thousand bushels in ten hours.

Some of the large growers have curing sheds and cribs, so that the onions can be cured under cover, away from the sun, rain and weather. These curing sheds are just open with a roof over them, and the crates are piled up in them in such a manner as to have a good circulation of air.

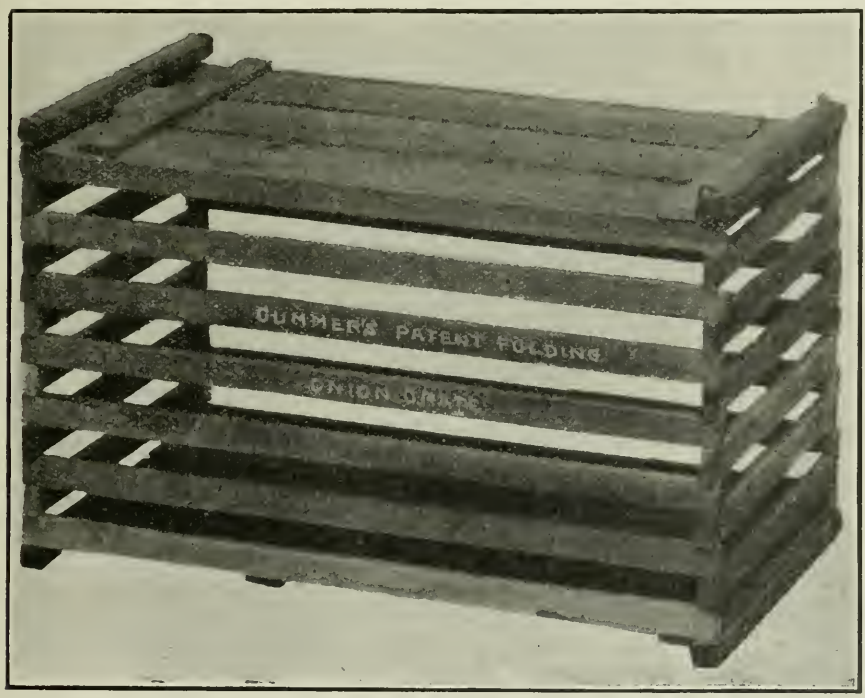
A description of a shed that was erected this summer will serve to show the type and cost of the same: Size of shed 48 feet wide, 96 feet long, covered with Carey roofing, two 2 x 8 inch plank, bolted together used for posts, set in cement piers two feet square, four rows of posts used in width, the two outside rows being set four feet inside the eaves, the next row twelve feet from the outside row, leaving a sixteen foot space in the centre so that two teams can pass; the posts running lengthwise of this shed being spaced twelve feet apart. Cost of shed $700.

A description of the crib that is approved as best will suffice. The crib proper is 26 feet in width and with a two-foot eave projecting over, a five foot crib on each side, with a driveway down the centre between the two

cribs 16 feet in width. Six-inch studding is used spaced two feet apart and tied together seven feet from the floor. 1 x 4 inch slats with an inch space between them are used for sides and ends. $1\frac{1}{2}$ x 4 inch slats are used

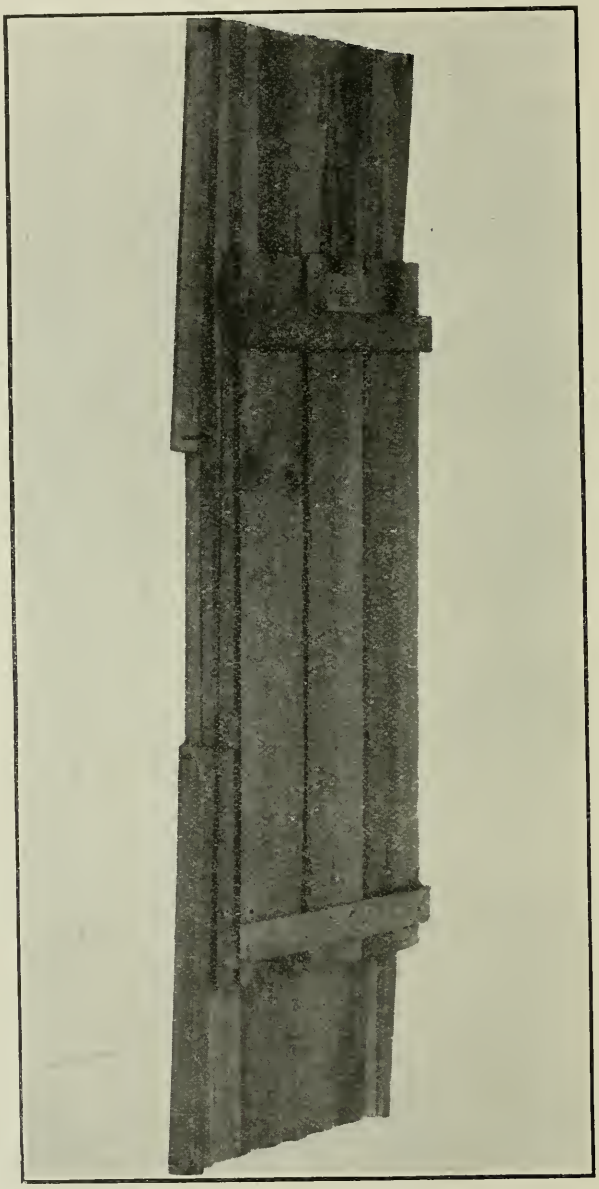
Curing Crib.

for flooring, with an inch space between them. Hinged doors, 22 x 30 inches for filling, are six feet apart along the sides of the crib, and the ones on the inside are five feet from the bottom and those on the outside seven



Folding Crate.

feet from the bottom of the crib. The upper part of the crib is filled from the inside by emptying the onions over the top, as the cribs are ten feet in height. The crib is set up from the ground at least one foot. It has slides on the inside just at the bottom for the purpose of ease of emptying.



Folding Crate Ready for Shipment.

The crib which I have just described is 150 feet in length and is covered with Carey roofing, and cost $800 three years ago. It holds eight thousand bushels of onions in the cribs proper, leaving the sixteen foot driveway for the storing of onions in crates.

The big advantage of the crib is that it does away with a number of crates. The big growers who have cribs do not find it necessary to have a

crate for every bushel of onions grown. Some of the large shippers have crates that they rent out to the small growers. Should the small grower sell to them, no charge is made for the use of them. Should he sell to some other buyer, the grower pays two cents for their use.

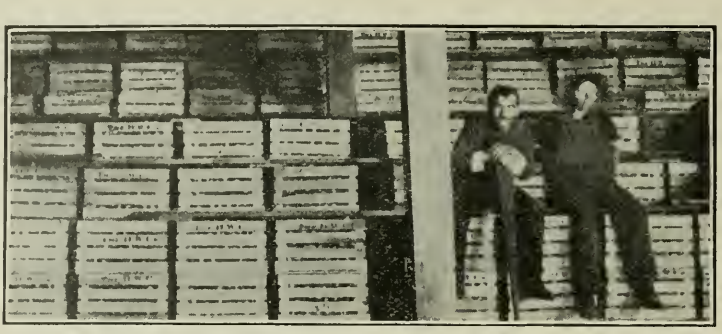
Marketing. The red and yellow onions are marketed in different ways. Some are shipped in bulk, that is, loose in the car, some in one hundred pound, and some in one hundred and forty pound sacks, it all depending upon the markets to which they are consigned. Some are still shipped in barrels with fifteen inch heads holding about two bushels, but the barrels are going out of use on account of cost. The white onions are smaller than the red or yellow varieties, the size desired being slightly larger than hen's eggs. They are graded up as fancy stock and are shipped in Cummer crates. These are a slatted folding crate built on the same principle as the slatted egg crates used by the farmers of Ontario. They hold a bushel of onions, and cost laid down from $14 to $15 per hundred. White onions are much harder to grow, cure, and store, and always command a higher price, especially in New York City, the price this year being from fifty to one hundred per cent higher than red or yellow stock.

Storing. The warehouses used for storing onions are frost-proof buildings with provision made for ventilation. All persons who store onions agree that the buildings should be frost proof, but most of them hold different views regarding the means of ventilation and methods of piling the crates.

Neumann & Co., commission merchants, of Indianapolis, Ind., have an onion storage at Kimmel, Ind., 40 x 60 feet and 16 feet high inside, built on the following plan: Two thicknesses of inch lumber with building paper between them, then a 2 x 4 inch studding, then a board and paper lining, then 2 x 6 inch studding, another boarding, paper and matched sheeting on the inside, making altogether five thicknesses of boards, three of paper and two air spaces, one four inch and one six inches. The ceiling is of matched lumber, and has large trap doors which are opened in mild and closed in cold weather. The warm air finds an outlet through these traps, and then out through doors in the gable ends of the building. This building has a cement floor and six inch tiles through the walls just above the floor line. These are placed about eight feet apart, and are used for the admittance of fresh air. They are closed down during cold weather. This building cost $3,000, and will hold 14,000 bushels of onions. The method of storing last year was as follows: An eighteen inch space was left around the entire building for the purpose of looking after the tile ventilators. The onions were all in slatted crates, and three rows of crates were placed together, the rows running across the building. They were piled sixteen crates high, a space of four inches being left between every three rows. This method of storage proved entirely satisfactory, as the loss by shrinkage was only about three per cent.

At Kendalville, Ind., there is a storage house 40 x 143 feet, two storeys high, the ground or lower storey eleven feet high, the upper storey fourteen feet high. This house is built of cement blocks, with a lining of insulated paper inside, then a 2 x 4 inch studding, another lining of paper and finished on the inside with matched sheeting. It is built into the side of a gravel bank. On one side, the upper storey only is exposed, while on the other side all of the building is visible. It has a side track running along the lower side, and the onions can be trucked right into the cars from the lower storey, as the floor of the car and the floor of the storage house are on a level. When loading a car from the upper storey, the onions in sacks slide down a chute into the car. This house was built in 1907 and cost $5,700, and has proved very satisfactory.

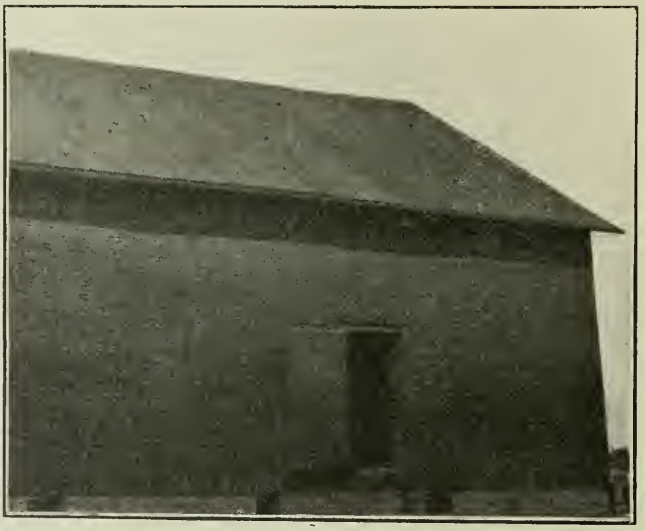
In Hardin County, Ohio, the storage house that is in general use differs somewhat in construction from most of those in other localities; a description of one will serve for all, as about the only difference to be found is in size. Forty feet wide, one hundred and ten feet long, sixteen feet from floor to



A Merhod of Storing.

ceiling, walls built as follows: four thicknesses of sheeting, four of felt paper and two air spaces, one of these being eight, the other being two inches. A basement six feet deep is under the entire building, the walls being built of stone, and two feet thick.

12 x 12 inch oak sills set on 2 x 6 foot stone piers, two rows of piers used and 3 x 12 inch joists spaced 18 inches apart from centre to centre, slatted



Onion Storage House.

flooring $1\frac{1}{2}$ x 4 inches is used with an inch space between each piece of flooring. Eight ventilators on each side and two one each end, one foot square. are in the basement, a short distance below the floor line. Large trap-door ventilators in the ceiling, with doors in the gable ends over the ceiling. also a ventilator one foot deep and ten feet long just under the ceiling at each gable. The idea of ventilation in these houses is admittance of fresh air in the basement, finding its way through the slatted floor, up through the crates

and onions, through the trap doors in the ceiling and out through the ventilators at the gable ends, and theoretically, at least, seems to be the ideal method of ventilation. The owner handles 150,000 bushels annually. This storage will hold about 40,000 bushels, not including the basement. The entire cost of operating, including storage, cribs, screening and loading, based on a six years' average, is about $2,000 per year. The shrinkage on stock in the above last year was, on yellow 5 per cent., on red 5½ per cent , and on white 12 per cent. Three years ago the shrinkage on red was 2 per cent., and on yellow 2½ per cent.

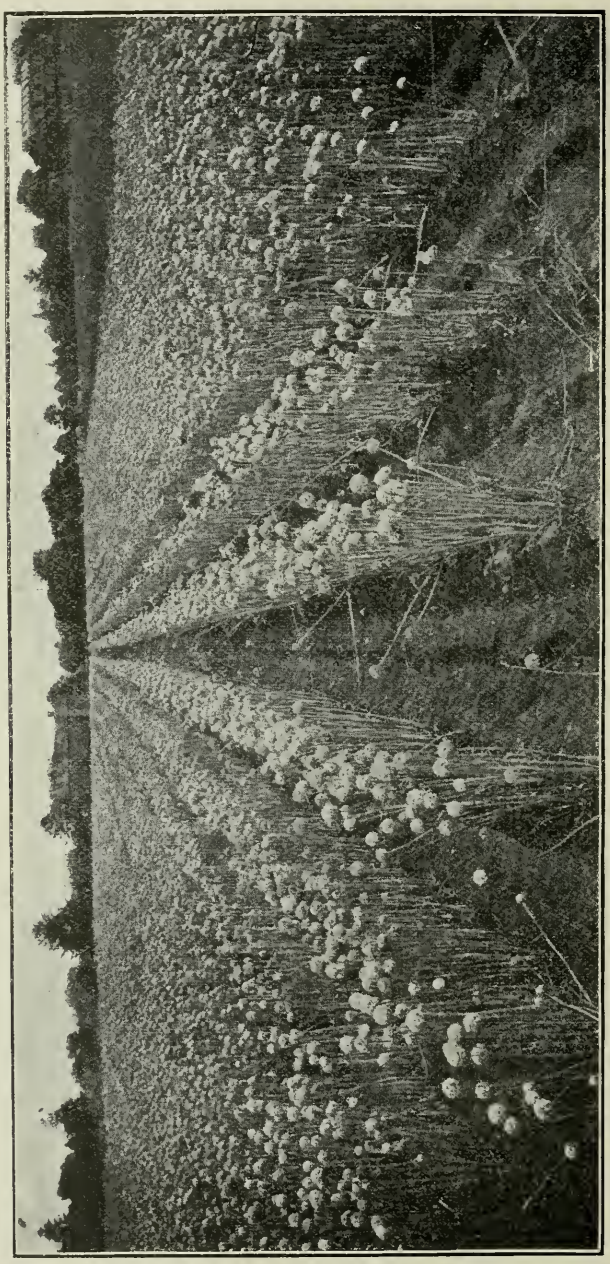
Horr-Warner Co., the largest growers of domestic onions in America, if not in the world, this year had five hundred and forty acres under cultivation. They have facilities for storing over 160,000 bushels of onions. The capacity of their different houses varies from 8,000 to 19,000 bushels each. They think that they get better results from a number of medium sized houses than from a few large ones.

In the ventilation of storage houses, one point was strongly fixed, and that is, not to have any of the ventilators go directly out through the roof. This has been tried and found unsatisfactory, as frost would gather on the sides of the ventilator. Should mild weather set in, the frost would melt and run down on the onions with damaging effect.

Should an order be received after the onions are in storage, say a month or so, the onions are again put over the screen to remove all loose peelings and to be sure that nothing is shipped but good, clean, bright stock. All the big shippers say that good market appearance helps to sell the goods.

Growing Seed: Many of the large growers of domestic onions grow their own seed. For this purpose the bulbs should be selected very carefully, both as regards shape, color and size. The best time to make the selection is when the onions are going over the screen. By having a crate at one side of it the extra choice bulbs can be picked out and dropped into it, and can be stored separately until spring. In Michigan and Ohio the seed is grown on upland, never on muck soil. Good rich clay or sandy loam is used, and the bulbs are planted in rows about three feet apart and about six inches apart in the row. This admits of horse cultivation and ease in working. About one hundred and twenty-five bushels of bulbs are used in planting an acre; the crop varies according to season, from one pound to upwards of four pounds of seed from each bushel of bulbs planted. Care is exercised in gathering the seed bulbs. The field is gone over sometimes four or five times, cutting off those that are ready, about two inches of the stock being removed with the seed ball. They are generally gathered in bags or sacks, and are taken to the seed drying house where they are spread out on shelves. These shelves are generally about one foot apart and the bottoms are made of one-half inch wire netting. Doors and windows are kept open on bright days to admit free circulation of air to aid in the drying of the seed. After the balls are thoroughly dry, the seed is beaten out with a stick while the balls are still on the shelves, the wire netting on the bottom of the shelves allowing the seed to fall on the floor. Others use a flail as a means of separating the seed. It is then gathered up and run through a mill to clean it and blow off the light stuff. After it is cleaned it is placed in barrels or tubs and water poured over it until all the good seed is entirely immersed, all the light and poor seed that floats being discarded. It is then thoroughly dried as quickly as possible. If it remains damp for any length of time it will mould or germinate, thus spoiling a large percentage. The big drawbacks to onion seed growing are hail, high winds, and danger of blight during the time the seed ball is filling.

Pickling Onions. Soil of same general nature as will grow a good crop of domestic onions can be used for growing pickling ones, with the possible exception of soil of a clayey nature. This kind should be avoided on account of the difficulty of harvesting. The soil need not be quite as rich



A Crop of Onion Seed.

as for a crop of market onions. In a field of four acres in Ohio, six to eight tons of manure were applied per acre, the land having been plowed in narrow strips in the fall at a cost of about $10 per acre. In the spring it was har-

rowed and one thousand pounds per acre of complete fertilizer 2-8-8, costing $26 per ton, was added. It was again harrowed and planked. Total cost of spring preparation and fertilizer, $15 per acre. Thirty-two pounds of seed, furnished by the pickling factory and costing $1.42 per pound, was sown per acre in rows ten inches apart. Cost of seed and seeding was $46.70. Wheel-hoed four times at an estimated cost of $8 per acre. Hand weeding was done three times, and part was gone over four times at an estimated cost of $15 per acre. Pulled by hand into windrows, piled thin and in such a manner that the tops cover the bulbs as much as possible to prevent sunburn or scald. After drying some days they were crated by hand and hauled promptly to the topping machine at an estimated cost of $12 per acre.

It is said that twenty cents per bushel has been paid for topping and sorting by hand. Possibly fifteen cents per bushel will pay for topping and sorting by machine. Crop averaged five hundred and four bushels per acre, making cost of topping and sorting $75.60 per acre. Cost of delivery to salting station, $6. Total cost of growing, harvesting, and delivery, including value of land, estimated at $100 per acre, $198.30.

Total receipts per acre, $351.93, divided as follows:—158 bushels 20 pounds of small, under ¾ of an inch in diameter, at $1.25 per bushel of 50 pounds, $198; 219 bushels 27 pounds medium, over ¾ of an inch and under 1¼ inch in diameter, at 50 cents per bushel, $109.77; 126 bushels 6 pounds large, over 1¼ inch in diameter, at 35 cents per bushel, $44.16. The cost is figured at what it was estimated it cost to grow the crop; an odd item may be a trifle low.

The growing of Dutch sets requires more skill and experience than the growing of either domestic or pickling onions. The soil and preparation is about the same as for a crop of the latter. The Planet Junior Drill with the set attachment is the machine I have seen used, sowing a row about two inches in width. Should you wish to grow only a small patch, you can open some drills about two inches in width and a foot apart. For sowing the seed a small tin can of a diameter of about two inches can be used. Punch a number of small holes in the bottom, slightly larger than the seed, but not large enough for two seeds to pass through the same hole at once. By filling the can with seed, and lightly shaking it along the open drill, it will sow quickly and evenly. Cover the seed in the drill with fine soil from one-half to one inch in depth, depending on your soil, the light covering for heavy soil and the deep covering for light soil. One ounce will sow about forty feet of a drill.

The varieties used for growing sets are Yellow Flat Danvers, Yellow Dutch or Strasburg, Australian Brown, White Portugal or Silverskin, Extra Early Red, and Red Wethersfield.

In the vicinity of Chicago, which is the largest set producing section in America, the rows are one foot apart, and from sixty to seventy-five pounds of seed is used per acre.

The cultivation and weeding is practically the same as for market onions. When the onions are ready to be harvested, some people use steel hooks to loosen the sets from the soil. Others use an attachment consisting of short steel blades about two inches in length. Two of these blades are used on a double wheel hoe, and the points of the blades are kept about an inch apart. The machine is pushed along by hand, with the blades deep enough in the soil so as not to hurt the onion. The onions are then picked up, with one hand grasping as many as it can conveniently hold, and as near the bulb as possible, and the other hand is then used to twist off the tops. They are then deposited in round half-bushel baskets, and when the basket is full

it is taken and emptied into trays. These are three feet by four feet in size, with sides made from one inch lumber, and are three inches high, the ends of lumber of the same thickness and four inches high. They also have a four-inch piece across the bottom to give them stability. The bottoms are slatted and are made from four foot lath with a space of one-quarter to three-eighths of an inch between. Each tray holds one and one-half bushels.

These trays, when filled with onions, are piled up one on top of another in the following manner—twenty-one at the high end, twenty in the centre, and nineteen at the low end. Some boards or strips of waterproof paper are placed over the tops of the piled crates to protect the sets from the weather, and it is then known as a house. The four inch end of the trays when piled leaves an inch space at the sides of the tray for the purpose of allowing the air to enter and dry the small bulbs.

After they are thoroughly dried, they are then taken to a Clipper cleaning machine and run through that, removing all the dried top remaining on the onion as well as any dried or loose peeling. It also sorts the sets as they pass over a screen, all over three-fourths of an inch in diameter being

Harvesting Onion Sets.

considered too large for sets and are used for pickling onions. The sets, after coming from the machine, are boxed or barreled for delivery, or are put in storage. If put in storage for winter or spring delivery, they are placed back on the same trays and these are piled up in the storage house, which is a frost-proof building. They should be kept as dry and cool as possible, but must not be allowed to freeze.

Some of the operators in sets in the Chicago district contract with small growers to grow sets for them. The contractor furnishes the seed and the trays for curing the sets, and pays the growers seventy to eighty-five cents per bushel for growing. This must be close to the cost of production, as the contractors have hard work to increase their acreage, and in some cases to induce the grower to continue to grow sets for them.

One large firm there grow about 250 acres of sets annually, using four Planet Junior drills attached together, and drawn by a horse, for sowing their seed. They also grow forty or fifty acres of seed to furnish their supply for the following year.

A good crop of sets yields from three hundred to four hundred bushels per acre.

In Ontario, and, in fact, Canada, the onion set district is practically confined to Huron County, with the village of Hensall the chief centre. The methods used here differ somewhat from those in the Chicago district. The contractors sell the seed to the grower of the sets and buy the sets from the growers in the fall, the price paid this year being four cents per pound. The contractor has his own seed drills and sows the seed for the grower. The method of harvesting is somewhat different also, three rows being pulled and placed in a windrow (no tops removed from the bulb) and left to dry in the sun until such time as the top will rub off when going through the cleaning machine.

For winter storage they are placed in trays and stored in much the same manner as previously described.

The standard weight for onion sets is forty pounds per bushel in the fall and thirty-two pounds per bushel in the spring, the shrinkage being about twenty per cent.

The estimated onion set production for Ontario is about 300,000 pounds, an increase of over fifty per cent. in the past five years. The Canadian market is from coast to coast, onion sets having been shipped from Hensall to the Yukon.

Onion Production in Ontario.

The onion markets of Canada are supplied as follows: In the month of April, Egyptian onions make their appearance and large quantities of them are sold, especially in the Maritime Provinces and Quebec; a few cars come into Ontario. These are followed by Bermudas, which are not good keepers, and are off the market by the time our own onions are ready. The strongest competitors we have in our markets are the Spanish onions. These come into direct competition with our onions, both in regard to season and price. There are two varieties which come from Spain, Denias, which are the very large Spanish onion, and which are shipped in crates holding about forty pounds; and Valencias, shipped in cases holding approximately one hundred and twenty-five pounds. The price of Valencias varies from four shillings a case upwards, with perhaps an average price of five to six shillings per case, f.o.b. Liverpool.

Owing to the high duty on onions coming into the United States, (forty cents per bushel, compared to the Canadian duty of thirty per cent. *ad valorem*) the consumption of foreign onions per capita is higher in Canada than it is in the United States, and the high American duty practically prohibits Canadian onions from going into that country.

If it were possible for the growers in the shipping districts to form an association to look after the proper distribution of the crop, so as to properly supply the different markets, it would be a step in the right direction. It would also be of material advantage and profit to themselves in the distribution of their crop. In some of the districts there seems to be a dread of over production. This should not be the case, and the sooner the growers get over that idea the better it will be for them. At present we are not supplying our own markets, but import American onions to the extent of over 78,000 bushels annually over our export trade, and these figures are based on a four years' average, as can be seen by referring to the table on page 14. When in Montreal last fall, in an interview with Mr. O'Shea, the Dominion appraiser of fruits and vegetables, regarding the importation

of American onions into our markets, the question was asked, how many cars of American onions come into our markets, and to base his estimates on a five years' average? His reply was that he could not tell exactly, but a conservative estimate was an average of twenty-five cars annually.

In supplying the markets of the several Provinces with Ontario onions, the following was learned through correspondence with brokers and commission merchants in the large markets. The Nova Scotia markets will take about thirty-five car loads, containing 14,000 sacks of seventy-five pounds each. About twenty carloads go into St. John, N.B., and about fifteen into the Province outside of the city. The Province of Quebec will take about twenty-five cars annually; Prince Edward Island about six or seven cars of Ontario onions. In Newfoundland, Canadian onions are not a large factor, the market being divided between American and Spanish grown ones. The large firms there have an extensive trade with Portugal and Spain, sending out cargoes of fish, bringing back in their own vessels large quantities of Spanish onions at a trifling freight cost. Newfoundland imports about $10,000 worth of onions annually, of which Canada sends about $1,000 worth. Winnipeg and Manitoba import about twenty-five cars of onions annually. These are almost all brought from Minnesota, as, owing to cheaper freight rates, they can be imported from the United States, duty paid, cheaper than they can be brought in from Ontario, owing to the high freight rates from this Province, the freight rates on onions from Ontario points to Winnipeg being 49 cents per one hundred pounds all rail, and 44 cents per one hundred pounds rail and boat. If the growers in Ontario made proper representation of the situation to the railroads, this might be remedied and a good market for our onions developed in the West.

The variety of onions demanded in the different markets varies, and it would be well for our growers to give some study to it. The Provinces of New Brunswick and Nova Scotia demand a yellow onion. Quebec favors almost exclusively a red onion. Manitoba uses about sixty per cent. of red and the balance yellow. The markets of Ontario want the yellow. The Province of Ontario itself has a large market to supply. The large cities are mostly supplied by the local growers in the vicinity, but immense quantities are shipped to the North Shore of Lake Superior and Georgian Bay. It is estimated that this year it took twenty-five cars to supply these markets. The supply of onions to New Ontario will ever be on the increase.

The wholesale price of onions varies. The average price in Toronto markets per bag of 1½ bushels, 75 pounds, October 1st, was 98 cents; December 1st, $1,18; February 1st, $1.26; April 1st, $1.55. In Montreal markets on October 1st, $1.14; December 1st, $1.48; February 1st, $1.55; April 1st, $1.63. The above figures are based on the prices quoted for onions on the first of the respective months for the years 1903 to 1908 inclusive.

Using the same prices for the same months, we find that the average price for the crop of any one year, that is, the price onions were quoted at on October 1st and December 1st of the year the crop was grown in, and the price on February 1st and April 1st of the following years, was as follows:— Toronto market, crop of 1902, 75 cents; 1903, $1.40; 1904, $1.70; 1905, $1.20; 1906, $1.30; 1907, $1.11; 1908, 80 cents. Montreal market for the same years beginning with the crop of 1902, 90 cents, $1.80, $1.77, $1.32, $1.75, $1.25 and $1.40 respectively. Onions on Montreal market to-day (February 1st) are quoted at $4 per barrel.

The above figures cover the past six years from 1903 to 1908, inclusive, the lowest period being for the crop of 1902, when prices averaged seventy-five cents per bag in Toronto market, and ninety cents per bag in Montreal.

Seventy-five cents per bag was also the average price the past fall in Toronto. The highest prices reached during the above term of years was in the month of April, 1905, when the price was from $2 to $2.25 per seventy-five pound bag, both in Montreal and Toronto markets.

As will be seen by the statistics of the onion industry of Ontario, found elsewhere in this report, the Scotland district in Brant County, the Leamington district in Essex County, and the Clarkson district in Peel County are the largest shipping districts. The Leamington district is the only one I know of where onions are grown on muck soil, the other districts growing them on soil that varies from sandy loam to clay loam.

The methods used in the preparation of soil, seeding, and growing, do not vary much from those used in the United States, which are described in the early part of this bulletin. The big difference lies in the methods used in curing and harvesting. The Ontario method used is to wait until the tops die down thoroughly before pulling the crop. They are then pulled and put in windrows, being spread out thinly and exposed to the sun. After lying some days they are topped by hand, and two of the windrows are thrown into one during the act of topping, that is, when topping, the onion is picked up and topped and deposited on the other side of the topper on to the cleaned ground. They are then left there for some time, generally until ready to be sacked and delivered to the car.

An Onion Field, Scotland, Ontario.

In sacking, baskets are generally used in gathering, which are emptied directly into sacks and a number of sacks placed together. Scales with the weight set at seventy-six pounds are then brought along. These scales are usually placed on a piece of broad board with a piece of rope attached for drawing the scales along from one pile of sacks to another. The bags are placed on the scales separately and weighed, some sacks being found too heavy and some too light. They are all balanced up to weigh seventy-six pounds, one pound being allowed for the bag and seventy-five pounds for the onions. Sufficient care is not exercised by the majority of the growers in gathering the onions. This applies both in regards to having the onions clean and in sorting out the small ones, "thick necks," and injured onions. When it is left to the individual to sort out the onions and leave the small ones, no two individuals will select the same, whereas the screen treats every one alike.

This fall, upon my return from the American onion districts, I visited the Scotland and Leamington sections and advocated the use of the screen for sorting, with the result that a number of the growers made and used screens for sorting their onions. In conversation with them later in the season, they all claim superiority for the screen and are strong advocates for its use in the future.

In the growing sections of Ontario no provisions have been made for storage and sending the onions to market during the winter months, the storage being done by dealers and commission merchants, who hold them over in sacks, generally storing them in cellars, and it is not a desirable way of storing onions for future sales.

It will be seen from the foregoing table of average prices, that the price of onions rises about in proportion to the length of time they are held after harvesting and leaving the hands of the grower. In my experience and memory of onion prices, covering twenty-five years, we had two crops (one of which was the crop of 1902) in which prices did not rise above the price set at harvesting; the balance of the time, it would have been a paying proposition to have stored at least a portion of the crop.

General Conclusions. From a study of the foregoing it will be seen that to place the growing of onions on a good sound basis, the following points are worthy of consideration:—

A study of the different markets, and the varieties demanded by them.

Good seed.

A study of soils and fertilizers, for the improvement of the crop, and increased yields.

A study of the insect pests and fungous diseases attacking the onion and the best means of combatting them.

The adoption of better methods in curing and harvesting, so as to place them on the market better in appearance, color, and condition.

The use of screens in the preparation of onions for market.

The formation of an association for the purpose of distributing the crop, so as to supply the different markets, and to avoid overloading or glutting any one market. This Association could also work for better freight rates, and the development of new markets, especially the Western Provinces.

Local associations in the growing sections will aid materially in the production of better crops, the gathering of statistics and information relating to the growing and disposal of the crop, and the distribution of that information through its members and otherwise.

Co-operative associations in the larger onion sections should be of material advantage to the growers. Under capable management they could buy their seeds, fertilizers, machinery, etc., and dispose of the same to their members cheaper than they could be secured individually, erect storage and shipping houses, and dispose of the entire crop of the growers in any one section through their manager, who could devote his time to the selling end of the business, advertise and extend their markets; in fact, do everything to help the sale and consumption of onions. Local experimental work could also be done to better advantage under an association than individually.

Experiment with growing onion seed in Ontario, with a view to producing our own needs in onion seed, if it can be done economically.

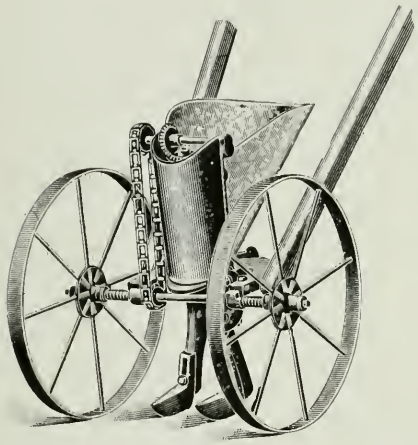
Fungous and Insect Pests.

Onion blight, or mildew, is a common disease of onions in Ontario. The fungus usually appears on one side of the leaf, about midway between its

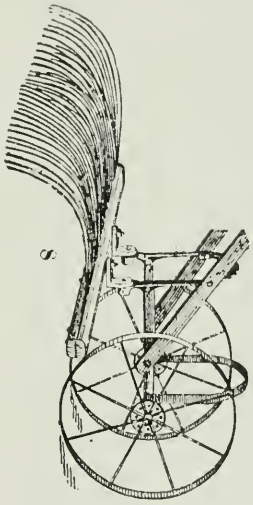
tip and base, from which it spreads rapidly through the entire leaf, causing it to wither and die. It usually makes its appearance after the bottoms have attained considerable size, and causes a premature dying, or ripening of the crop.

Treatment. Clean culture, the removal of all refuse or litter from the soil as soon as the crop is harvested. Spray with Bordeaux mixture, using a "sticker" made as follows: Resin, two pounds; sal soda crystals, one pound; water, one gallon. Boil till a clear brown color, usually taking one to one and one-half hours. Use an iron kettle. Dilute above amount with thirty gallons of Bordeaux mixture for use on cabbage or onions. Spray with Resin-Bordeaux made as follows: Melt five pounds of resin with one pint of fish oil over fire, cool slightly, add one pound soda lye with stirring; add five gallons of water and boil until the mixture will dissolve in cold water. Use two gallons of the mixture with forty gallons of Bordeaux.

Smut or Black Spore. This is most troublesome on white onions, and, when it becomes very bad, makes them almost unsaleable. Soak the seed for



Fertilizer Sower.



Hallock Weeder.

one hour in formalin solution: Formalin (40 per cent.) one ounce to two gallons of water.

Thrips. These are very minute insects, about one twenty-fifth of an inch in length, of a pale yellow color. They generally occur in very large numbers, and the injury is visible in the form of small yellow spots on the leaf, increasing in size until the tips of the leaves become yellow or brown. This greatly reduces the vitality of the leaf, and hence its efficiency as a bulb-builder.

Treatment. A good heavy rain washes off and destroys considerable numbers of them. They can also be kept in check or destroyed by spraying with kerosene emulsion, used at the rate of one part of emulsion to ten parts of water.

Onion Maggot. The adult is a small fly, about half the size of the common house fly. The eggs are laid on the young plants early in the spring, and hatch in a few days, when the larvæ burrow into the bulbs. When full grown they pass into the soil and become pupæ, and the adult fly emerges some days later.

Preventive Measures and Remedies. A quick acting fertilizer in conjunction with planting at the right time. Crude carbolic emulsion, sprinkled along the rows over the plants, once a week. Making a furrow along the row of plants, in which is distributed a light dressing of nitrate of soda, and replacing the earth, helps on some soils. Some growers mix a small quantity of radish or turnip seed with their onion seed before sowing, and claim to get good results. Others sprinkle their onion seed slightly with kerosene or turpentine, believing that the smell of the same acts as a repellent to the fly from laying her eggs. Finely powdered tobacco dust sprinkled on the plants has been used as a preventive with some success.

Cut Worms. The use of poisoned bait placed through the garden will be found effective, this can be made as follows: bran, 50 pounds; molasses, 2 quarts; Paris green, 1 pound; and enough water to make a thick mash.

Varieties of Onions.

Yellow Danvers (1) also known as Flat and Round Danvers, a round onion of good size; thin yellow skin, flesh, white, fine grained, firm and of excellent quality; it ripens early, usually a week or ten days earlier than yellow Globe Danvers; a good keeper, largely used for growing sets.

Yellow Globe Danvers (5) is a selected strain of the preceding variety; the bulbs are thicker through, but not perfectly globe shaped like the Southport Yellow Globe; flesh and quality the same as Yellow Danvers.

Southport Yellow Globe (7) is of large size, perfectly globe shaped, skin yellow, flesh white and of good quality; a good keeper. It matures about a week later than Globe Danvers; a very profitable onion to grow.

Prizetaker (9). The best of the large mild onions; usually used for transplanting; skin light yellow straw color, flesh white and very mild; not a good keeper.

Australian Brown (4). A round flat onion, matures early; skin dark brown, flesh white and very firm; a good keeper. Onions of this variety have been known to keep a year.

Golden Globe (6). A globe shaped onion with light straw colored skin, flesh white and mild; probably the earliest maturing globe shaped onion.

Early Flat Red (2) of flattened form, not so thick through as the Wethersfield; matures early and will often form bulbs on a cold soil where other varieties fail; a good keeper, used largely for growing sets.

Red Wethersfield (3). Grows to a large size, rather flat in shape, skin deep purplish red; flesh purplish white, moderate grain, flavor rather stronger than the yellow onion; a good keeper.

Southport Red Globe (8). A handsome onion of perfect globe shape, grows to a large size; skin deep red, flesh fine grained, mild and tender; a good keeper and deserving of general cultivation.

Southport White Globe. Resembles the Southport Red Globe in shape; both skin and flesh are pure white, fine grained, mild flavor, good keeper. This variety commands the highest market price, but requires more careful handling than the red or yellow varieties.

Barletta, used very largely for pickling, is a round white onion of handsome appearance.

The Extent of the Onion Industry in Ontario.

Below will be found acreage and yield of onions of 18 counties of this Province, as accurate as is possible to obtain by correspondence. There

were shipped from Scotland station 94 cars of onions, from Leamington, 68 cars, from Brantford, 14 cars. These shipments cover the 1908 crop and are from the beginning of the shipping season to February 1st, 1909.

County.	Acreage	Average yield per acre. Bushels.	Total yield. Bushels.	Variety and percentage of each.
Brant	185	350	64,750	90 Y., 10 R.
Essex	100	400	40,000	55 Y., 45 R.
Carleton	90	400	36,000	50 Y., 25 R., 25 W.
York	60	375	22,500	95 Y., 5 W.
Peel	60	350	21,000	88 Y., 12 W.
Norfolk	35	375	13,125	85 Y., 15 R.
Simcoe	35	300	10,500	90 Y., 10 R.
Lambton	20	275	5,500	90 Y., 10 R.
Frontenac	20	150	3,000	75 Y., 25 R.
Haldimand	15	300	4,500	50 Y., 50 R.
Lennox	10	300	3,000	50 Y., 50 R.
Wellington	9	250	2,250	90 Y., 10 R.
Huron	8	300	2,400	85 Y., 15 R.
Oxford	7	400	2,800	80 Y., 20 R.
Grey	6	300	1,800	90 Y., 10 R.
Hastings	6	285	1,710	50 Y., 50 R.
Elgin	4	315	1,260	85 Y., 10 R., 5 W.
Ontario	3	200	600	100 Y.
Total	673	312	236,695	Y. denotes yellow, R. red & W. white.

Of the average yield per acre, 77.7 per cent. were yellow, 19.7 per cent. red and 2.6 per cent. white.

IN MEMORIAM—DR. JAMES FLETCHER.

The PRESIDENT: We have a sad duty to perform this afternoon. You are all aware of the death of Dr. Fletcher, of Ottawa, who passed away recently. I will ask Mr. Delworth to move a resolution expressing our sympathy with the family of our late lamented friend.

T. DELWORTH: You all remember that at our Convention last year we had the pleasure of listening to a very able address from the late Dr. Fletcher, who has recently passed from our midst, leaving behind a legion of lamenting friends. He was one of the ablest men in his profession, and those of us who knew him were charmed by his disposition and manner, and I move a resolution requesting our secretary to send a letter of condolence to his widow and family.

F. F. REEVES, in seconding the motion, also expressed in feeling words the loss the Vegetable Growers sustained in the death of our departed friend, whose heart always beat in unison with ours. The resolution was carried.

EXPERIMENTAL WORK IN VEGETABLE GROWING.

A resolution was passed that the Provincial Government be requested to conduct experiments in the growing of vegetable seeds on the grounds at Guelph College, Jordan Station, the new Experimental Farm at Driftwood, and at such points as may be deemed desirable, also that in the opinion of this Convention, the Dominion Government should institute a series of experiments to determine what varieties of vegetable seeds can be successfully grown in Canada.

IRRIGATION AND ITS EFFECT ON THE GROWTH OF VEGETABLES AND SMALL FRUITS.

By W. T. Macoun, Ottawa.

There were few places in Canada during the growing season this year where the weather was not very dry for a longer or shorter period. In some parts of the country, and particularly in Eastern Ontario, the weather was too dry to obtain average returns from vegetables and small fruits from early in June until the 17th of October, when the drought was broken. At Ottawa, the rainfall was about 4 inches below the average from April to October. Not for many years has the need for a regular supply of moisture been so impressed upon vegetable and small fruit growers, when thousands of dollars were lost to them through an insufficient supply of moisture during the growing season. In Eastern Ontario the potato crop was, in places, almost a failure. Cabbage and celery suffered badly, the latter where it can be used at all being very short. Onions were much affected, the crop being greatly reduced, and other vegetables suffered also. Strawberries were scarcely more than half a crop, and raspberries the same. The time seems opportune, therefore, to find out whether in Ontario it is likely to pay to supplement the rainfall with artificial irrigation.

The droughts in this Province are usually of comparatively short duration and rain comes before the effect of the dry weather is apparent, although the growth may have been checked, but so gradually that it is not noticed. This probably accounts for the fact that irrigation has not received much attention, but if we think of the marked improvement which rapidly takes place after a rain, is it not suggestive that moisture might be given artificially a few days sooner and thus ensure a continuously rapid growth of the crop? In arid regions during the growing season irrigation is absolutely necessary, but it is quite a different matter in Ontario, where the average rainfall is a fairly liberal one and where the number of times when it is desirable to irrigate is limited, and where in some seasons it may not be necessary to irrigate at all. Such conditions would not apparently be conducive to the establishment of expensive irrigation plants which in some seasons might be altogether idle. The point to consider, therefore, is how can the vegetable and small fruit growers maintain a sufficient supply of moisture, available to the growing plants, to ensure maximum crops each year?

The soil must, first of all, be in the best possible condition to retain what rain falls and to conserve the ground water. If the surface soil be shallow with a hard subsoil, moisture which comes in the form of rain will not sink fast enough and it may be evaporated in a short time. The ground water also will be evaporated quicker than if the subsoil were broken up, thus lowering the watertable and also permitting the rain water to go down to a reasonably depth. Good tillage and good drainage also will ensure the quick disappearance of surface water. Thorough cultivation is essential, both for the conservation of moisture and the aeration of the soil. But it is scarcely necessary to bring these facts before vegetable growers who practise such intense methods that they could not obtain the crops they do unless their soil were worked to a good depth and the surface kept loose.

Notwithstanding the intensive cultivation practised by vegetable and small fruit growers, their soils do become too dry at certain times, some becoming drier than others.

Ontario Horticultural Exhibition, 1908.

Vegetables and small fruits may be injured by too much moisture, the crop suffering both from the direct effect of the excess of moisture and from the increase of disease favoured by moist conditions, some kinds of vegetables suffering more than others, just as certain kinds suffer in dry weather more than others.

In Ontario water may be obtained for irrigation purposes from streams, surface and artesian walls, and from ponds or reservoirs constructed for holding the rainwater. Sometimes it may be possible to obtain water from the city or town supply.

Water may be pumped either by a gasoline, electric or steam engine, by wind or horse power.

There are several methods of applying it to the growing crop. Here are some practised in New Jersey as given in Bulletin 87 of the Office of Experiment Stations, Washington:

"Furrow Irrigation. Irrigation by furrows consists simply in allowing water to flow between rows when the plants are large enough to fill the ground with roots, or in making a furrow in which to run the water next the row on one or both sides of small plants. Furrow irrigation has been most successful on potatoes where there was just enough slope to make the water flow slowly when a large volume is started down the row. With greater slopes irrigation washes the soil in proportion to the steepness of the slope. Where the ground has too little slope to make the water flow well, several lengths of tarred hose may be laid down the row, and when the water has flowed nearly the length of the first piece a connection is made and the water let out at the end of the first length, and so on. This plan should be followed when the row is so long that the upper end gets too wet before the lower gets wet enough. Where the land slopes so much that a large volume of water washes it, the difficulty can be partially overcome by dividing the water into small streams and running it down several rows at once. This is done by making small ditches or furrows with the hoe to carry the stream to the different rows, or it may be done with a distributer. A small hose is attached to the openings and carries the water to the row desired. With these pieces of small hose, about 25 feet long, there is no need to change the position of the distributer until a space 50 feet wide has been watered. The distributer is made of tin or sheet iron.

"Where there is a long gentle slope, the lower end of the land is very often more moist than the upper end, although rows of potatoes 500 feet long have been successfully irrigated by starting the water at the upper end and allowing it to flow the entire distance.

"In connection with furrow irrigation, the question naturally arises: How far does the water soak laterally? When potatoes are ridged and the water run between the rows, there will be lateral soakage enough in sandy soil to make that under the potato row quite moist.

"Flooding Small Beds of Plants. Small beds of plants often need careful and thorough watering. It is quite commonly supposed that sprinkling is the only available method in this case. Two methods of flooding were tried on beds of cabbage plants. In one case, the bed was ploughed so as to slope towards the dead furrow in the middle. Small furrows were then made along the two edges of the bed with a hand plow. Water was run down the two small furrows, and made to overflow by damming with a board at short intervals. Water was also run down the centre furrow and allowed to overflow, but this was not very effective.

"In another case the bed was ploughed so as to leave the whole a slight ridge. A furrow was made with the hand plow down the centre of this

Ontario Horticultural Exhibition, 1908.

ridge, and water ran down and was allowed to overflow on one side only at a time. Both of these methods were found to be very satisfactory. When the plants were of considerable size, the ground was thoroughly wet without wetting the leaves. It worked better after the first irrigation, or after the freshly plowed ground had been rained on. One irrigation was performed on the freshly made bed, and although it was successful, considerable trouble was caused by the washing away of the bank of the small ditch.

"John Repp, of Glassboro, N.J., irrigates 3 acres of field lettuce when small by means of movable sprinklers attached to rubber hose. When the lettuce is large, he floods the ground by letting the water flow out of the open ends of hose, moving this from place to place. He considers the method very satisfactory. Another plan is to have overhead sprinklers.

"The time to apply the water will, of course, depend on the weather, but the judgment of the grower is also an important factor. In the dry districts the plan is to thoroughly soak the ground at fairly long intervals, then follow with good cultivation. In Ontario where there is usually a fair supply of rain during the growing season, it will probably be found better to irrigate oftener and not quite so thoroughly, as, if a heavy rain followed a soaking from irrigation, more harm than good might be done. The judgment of each individual grower will have to be used also as to the amount of extra water it is desirable to apply, the character of the soil and subsoil and the slope of the ground being important factors in determining the amount of water that the land requires to give the best results."

Construction of Irrigation Plants.

The Skinner System of Irrigation. What seems to be a good system of irrigation and one which is favorably reported upon by some of the correspondents from which letters have been received recently, is the Skinner System (The Skinner System Irrigation Co., Troy, Ohio). This provides for both greenhouse and outside irrigation. It is really a method of overhead sprinkling. For outside use galvanized iron pipes are used to convey the water. These are supported on upright posts high enough to permit of cultivating underneath, or about six feet above ground. In the galvanized iron water pipes are set nozzles about four feet apart or more, depending on the kind of nozzle used, the company supplying nozzles and machine for drilling the pipe to insert the nozzles. The lines of pipes with nozzles are from 40 to 60 feet apart, depending on local conditions. The water is applied in the form of a spray through the nozzles and is said to be distributed very uniformly if the plant is well installed. The company claims that "The initial cost is less than that of any other system of irrigation for equal area; the power required for pumping is a minimum; no water is wasted, and the entire irrigation is accomplished with a very slight amount of labor." The company informs us that the average cost of installation is $125.00 per acre. Bulletin 87 already referred to on "Irrigation in New Jersey" gives more information in regard to the irrigation of vegetables and small fruits in eastern America than we have been able to get from any other source. The following descriptions of some of the plants used in New Jersey in 1900 should prove interesting. The cost of engines and other items of expense will have changed since that time, but the difference should not be very material.

The irrigation practised in the east thus far has been on a small scale. Plants capable of irrigating 6 to 8 acres are the rule. In the following pages several small plants recently installed are described in detail as to construction and cost, in order that those interested may determine from the data

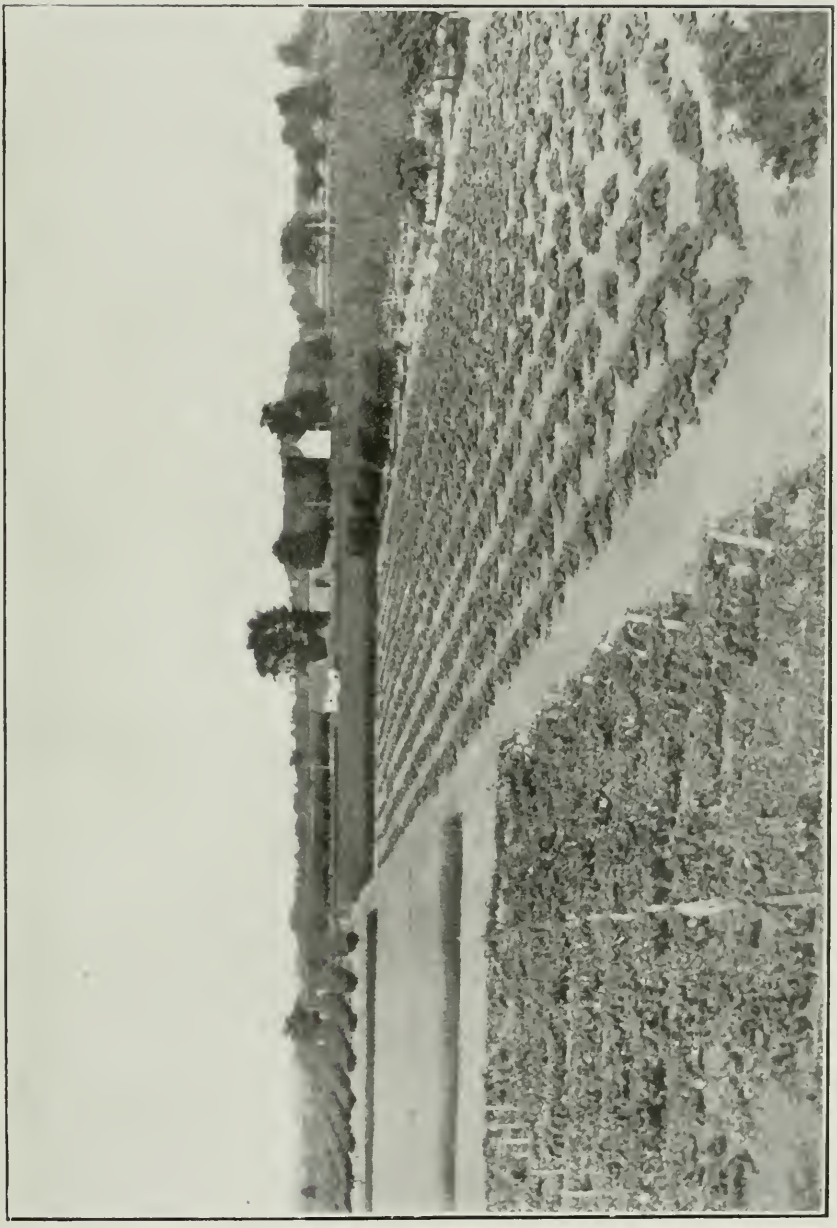


Photo by W. C. McCalla.

Fruit and Vegetable Farm, Grapes and Squash in foreground.

given whether under their conditions the installation of plants will prove profitable investments.

Plant of George A. Mitchell, Vineland, N.J. This consisted originally of 2.5 horsepower gasoline engine, a single-acting force pump and delivery pipe, consisting of a 2.5 inch wrought iron pipe, and condemned fire hose and home made distributing hose of tarred duck cloth. The engine and pump were enclosed in a building near the bank of a creek, a ditch leading the water to a pump. The water was then pumped 693 feet to the highest point on the farm, whence it was carried to different locations in the same manner as is now done. From 40 to 60 gallons per minute were pumped. The slope from the 20-foot elevation to the creek and south to Elmer road are comparatively regular, being steepest for about 150 feet each side of the highest point.

In the spring of 1899 the engine and engine house were moved farther away from the creek, and a ditch 15 rods long by $2\frac{1}{2}$ feet wide was dug to bring the water to the pump. The water in the creek is raised 6 to 12 inches by a dam. A No. 2. centrifugal pump was secured with a 10-inch pulley, and set 10 feet centre to centre of pulleys from engine. The 3-inch leather belting runs from $2\frac{1}{2}$ foot fly wheel of engine to pulley on pump. The engine makes 320 revolutions per minute.

An 18-foot length of 3-inch pipe is fastened to the pump outlet by means of reducers, and is held in a perpendicular position by four guy wires. An elbow with a 2-foot length of pipe is fastened to the top of the upright and standpipe. The hose is fastened to this by binding with wire. The hose used is the home-made kind hereafter described, and is $7\frac{1}{2}$ inches in diameter. The different lengths are connected by inserting a short length of stove pipe into the two ends and binding the hose to the pipe with wire. The large hose is used as the main, and extends 425 feet from the standpipe to the highest point on the farm. The hose is supported on trestlework, which slopes 4 feet from the standpipe to the end. This slope is sufficient to cause the water to flow through the hose without any forcing from the engine, and consequently there is almost no pressure tending to burst the hose. For 150 feet from the end of the pipe the hose rests on foot-wide chicken wire netting supported on cedar poles. For the rest of the distance the hose is supported in a trough made from cedar slabs. When the hose was 10 to 20 feet above the ground it would have been very difficult to build the trough. Where the hose strikes the ground at the top of the hill it connects with a distributer of galvanized sheet iron. The large opening of this distributer is about 7 inches in diameter and the smaller openings are 3 inches in diameter. Small hose is attached to the small outlets and the water is taken to the land to be irrigated through this. All the water from the pump, about 150 gallons per minute, can be forced through two openings when so desired. Some condemned fire hose that had been used during two years was used as distributing mains. This was laid in such a way as to interfere as little as possible with cultivation, being left in place during the summer and stored in the barn in the fall.

Tarred Duck Hose. This was made from 12-ounce duck torn into strips of the desired width and sewed into hose in a sewing machine. A mixture of four parts of coal tar to one part of boiled linseed oil was then brought to a boil and the hose drawn through the hot tar and next through a clothes wringer. Care should be taken not to allow the hose to touch the side of the vessel when it is hot, as it is liable to get scorched. Some of the hot mixture should be poured into the hose, before starting it through the wringer, to cover the inside with tar. The hose should dry two or three days, or better a week or more, before being used.

Cost of Plant. A statement of the cost of the above described plant follows:

2½ actual horse-power Webster gasoline engine, set up on brick foundation	$160 00
Pump set up	40 00
Bolts and adjustments	8 00
400 feet 2½-inch wrought-iron pipe, tees, laying and painting	45 00
Condemned fire hose, 900 feet, with connections, price not constant (approximately)	36 00
Building for engine, trench for leading water to pump, various arrangements for distributing water, etc., (approximately)	40 00
Total	$329 00

Plant of W. P. Stokes, Moorestown, N. J. Mr. Stokes erected an irrigation plant early in 1899. He uses a 2½ horsepower gasoline engine, a single acting force pump (cylinder, 6 by 12 inches). His source of supply is three driven wells with 2-inch pipe. These three driven wells are connected and the pump draws from all three at once; a flow of 50 to 60 gallons per minute being secured, although the wells would yield a great deal more. Before putting down the drive wells, an open well 15 feet deep and 8 feet in diameter was dug and bricked. Considerable trouble was experienced on account of the well caving in while being dug. The chief object of digging the well was to remove a bed of clay that might have made the driving very difficult. The three wells were driven from the bottom of the open well as far distant from each other as the diameter of the well would permit. The working heads and cylinder of the pump were put as near the bottom of the well as possible. The combination countershaft for the belting from the engine and for working the pump was at the top of the open well. The engine is placed at the usual distance from the countershaft, *i.e.*, 10 feet from centre to centre of pulleys. The engine is set on a brick foundation. The water is forced through distributing mains.

The wrought iron pipe leading from the pump, 75 feet in length, is 2½ inches in diameter. Four other pipes, 2 inches in diameter, lead out from the 2½-inch main. Fifty-foot lengths of tarred-duck hose are used for distributing the water. The outlets for attaching the hose are 25 feet apart. This hose is attached to a distributer, 9 feet in length and 3 inches in diameter. There are six outlets, 1¼ inches in diameter. The rows of plants, flowers and truck are planted 18 inches apart where possible, so that the six outlets of the distributer allow the water to flow between the six rows.

Mr. Stoke's land has gentle slopes, so that the water will easily run between the rows. There are four acres, including the lawn. A ridge runs through the middle, giving a natural slope in two directions, except that at one corner there is a rise.

As at present equipped, 60 gallons per minute can be pumped. There is reason to believe that the wells will yield much more water, but 60 gallons per minute is the capacity of the pumps. This is sufficient to cover 7 acres 1 inch deep each week, when the pump is kept going 10½ hours six days in the week.

Mr. Stokes has a clay subsoil. He grows a small amount of garden crops, devoting the larger part of his place to flower seeds, plants, and bulbs.

Cost of Plant. The chief items of expense in preparing for irrigation are as follows:—

Engine and pump erected	$190 00
Driven wells	60 00
Labor (estimated)	20 00
Total	$270 00

The expense of operation is about 40 cents for ten hours, besides one man's time.

Scribner Brothers, Navesink, N.J., installed an irrigation plant in the spring of 1899. They use an engine, pump and hose like those used by George A. Mitchell. The water is pumped from a small artificial pond, which is fed by a brook. Water is lifted and forced through a 3-inch pipe to a height of 18 feet at the rate of about 200 gallons per minute. The hose is laid in troughs made of inch boards, which are supported by single poles with side supports.

The main hose, 6 inches in diameter, slopes a little less than 1 foot in 100 from the delivery pipe to the highest point on their 10-acre truck farm. Three side lines of 4-inch hose can be extended across the farm. The main is permanent, but the side lines are laid down when irrigation is wanted. The T's used in the main hose for connecting with the side lines are made from stovepipe riveted together and dipped in coal tar and oil. They use, altogether, 2,800 feet of hose. They use two distributers similar to the one used by Mr. Mitchell.

The total cost of this plant, not including owner's share of labor, was approximately $100.00. The chief items of expense were as follows:—

Engine and pump erected, with suction and discharge pipe	$200 00
Pond	5 50
Building, 6 by 14 feet	7 00
Hose and connections	92 50
Troughs	45 00
Labor (estimated)	40 00
Total	$390 00

If the pump is kept going ten hours per day, six days in the week, 1 inch of water could be put on 25 acres each week. It would not be advisable to calculate on watering that acreage, however, as it is best to have a larger plant, so as to allow of some hindrances. The soil is gravelly to sandy loam. It cost them, to distribute the water, 75 cents per day, besides the time of four men on small plants and two men on large vegetables or trees.

About six acres of crops were irrigated: Tomatoes, cabbage, cauliflower, beets, carrots, radishes, celery, onions, potatoes, corn, strawberries, blackberries, raspberries, asparagus, lettuce, parsnips, salsify, rhubarb, parsley, and others. They do not use less than 2 inches of water at each irrigation, and from that up to 4 inches. Four inches was put on berries of the bush variety. They report that irrigation this year has paid on all crops to nearly the extent of the cost of the plant.

Plant of Hon. J. J. Gardner, Egg Harbor, N.J. It consists of an engine and pump like those used by George A. Mitchell and Scribner Brothers. The water is secured from a large open well, 12 by 12 feet. This was dug by making a curb of inch boards that would settle as fast as the bottom was dug out. After getting down 10 feet there was a great deal of fine clay. This was taken out by stirring the bottom and pumping out the

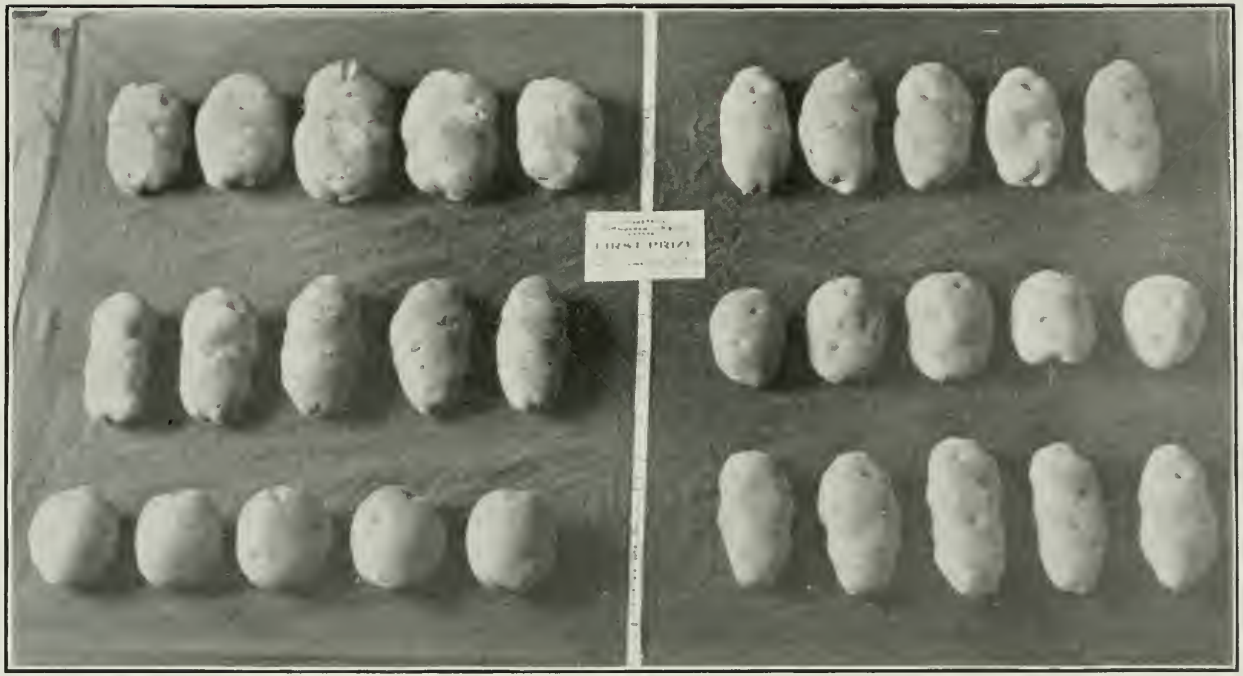


Photo by W. C. McCalla.

First Prize Potatoes from "Sunny Acres."

Varieties
Carman,
Manistee,
Deleware,

American Wonder,
Thoroughbred,
Early Boon.

muddy water with a centrifugal pump. The engine and pump are capable of drawing from 170 to 200 gallons of water per minute, but the capacity of the well at a depth of 12 feet is about 500 gallons per hour.

This farm of 300 acres is nearly all divided into slight slopes just sufficient for allowing the water to flow slowly between rows of plants. It is intended to make ditches along the ridges to carry the water, which will be allowed to flow over the side of the ditch at intervals desired. No irrigation was practiced this year, as the machinery was not in position in time. A number of pumping plants (at least five), with a water supply of 150 to 200 gallons per minute, would be needed to irrigate the 100 acres that it is intended to water.

Strawberries, blackberries, early potatoes, onions, corn, grass, etc., are grown.

Cost of Plant. The chief items of expense in preparing for irrigation are as follows:—Engine and pump, $210; hose, $20; total $230.

Plant of William Ash & Sons, Vineland, N.J. William Ash & Sons have a very fertile half acre plant fitted with overhead pipes, to which water-witch sprinklers are attached for irrigation by sprinkling. They use a 2½ horse-power gasoline engine and a Bulldozer power pump, which also supplies water for one-half acre under glass. The water, 30 gallons per minute, is forced through a 2-inch main, then through two 1½-inch laterals into several three-fourths-inch laterals, to which are attached 61 water-witches 24 feet apart each way. This system of pipes is supported on poles high enough to allow a horse to pass underneath.

They intend to put the pipes underground, and to have perpendicular pipes to which the water-witches are to be attached. Instead of forming squares, the water-witches will be arranged diamond shape. Several water witches are operated at one time, the water being shut off from others by faucets.

The half acre can be thoroughly watered in five hours. The water is pumped from an open well, in which the water stands within 8 to 10 feet from the surface of the ground.

Cost of Plant. The chief items of expense in preparing for irrigation are as follows: Pipe and water-witches, $250; engine and pump, $200; total $450.

This year cauliflower, followed by lettuce, was grown on this irrigated half acre. There is very little labour involved in the distribution of the water by this method. A man turns on and shuts off the water for the different side pipes. Only a small fraction of the power of the engine is used, so that much more water could be distributed through this system than is done if a larger pump were used. The soil is sandy and is heavily manured each year with New York horse manure.

Plant of Cuno Becker, Vineland, N.J. In 1899 he used a 2½ horse-power gasoline engine to operate his pump when the windmill did not pump enough water to keep his acre of ground thoroughly irrigated. His tank holds 4,000 gallons, which he fills with his engine and pump in about five hours. Only a fraction of the total power of the engine is used. Overhead ¾-inch pipe is supplied with faucets every 40 feet, to which is attached rubber hose leading to water-witches that can be moved from place to place. Two water witches, kept at work continually during dry weather, thoroughly irrigate 1 acre of very rich sandy land when planted very close in beets, radishes, lettuce, strawberries, or cabbage.*

* Mr. Becker has now put down paralled two inch pipes, 11 feet apart to which water witch sprinklers were attached at distances of 20 feet.

The chief items of expense in preparing for irrigation are as follows:—

Engine	$150 00
Piping	13 00
Hose, faucets and water witches	20 00
Labor (estimated)	7 00
Total	$190 00

A 2-inch pipe is used for a main leading from the pump. One man working about the garden can attend to the engine and move the sprinklers occasionally.

Cost of Small Irrigation Plants in New Jersey. The following table shows the cost of small irrigation plants in New Jersey:—

Name.	Power.	Acres	Crop.	Cost of plant.
John Repp, Glassboro, N.J	Steam	5	Strawberries, lettuce and onions	$600 00
Josiah H.Shute, Pitman Grove, N.J	Windmill	1	Onions, celery and Lima beans	156 00
A. P. Arnold, Vineland, N. J	Windmill	10	Sweet potatoes and garden produce	250 00
T. H. Whitney, Glassboro, N. J	Water	10		
Thos. R. Hunt, Lambertville, N.J	Gasoline	10	Berries, onions, celery and asparagus	360 00
Geo. A Mitchell, Vineland, N. J	Gasoline	10	Garden crops	329 00
S. O. Garrison, Vineland, N. J	Steam	10	Corn and celery	500 00
W. P. Stokes, Moorestown, N. J	Gasoline	7	Flowering plants, market garden	270 00
Scribner Bros., Navesink, N.J	"	10	Garden produce	390 00
J. J. Gardner, Egg Harbor, N. J	"	10	Strawberries, blackberries, potatoes, onions, corn and grass	230 00
Wm. Ash & Sons, Vineland, N.J	"	*1	Garden crops	450 00
Cuno Becker, Vineland, N.J	Gasoline and windmill	1	Beets, radishes, lettuce, cabbage and strawberries	190 00

* Cost of plant is much greater than is required for one acre.

No general statement can be made as to the value of the increased yields due to irrigation, but the owners of the above plants are all satisfied that their installation has been very profitable, and in nearly every instance have stated that they have made the cost of the plant in the increased crops the first year. Other small irrigation plants are described in Bulletin 148 of the office of Experiment Stations, Washington, D.C.

There do not seem to have been many results published of experiments in irrigating small fruits and vegetables in the United States and Canada, hence New Jersey experiments are again quoted.

Asparagus. The average results of five years' irrigation showed that the unirrigated plots had averaged about 3 per cent. higher than the irrigated. The top growth was, however, 4 per cent. greater on the irrigated. The first cuttings were greater on the irrigated than on the unirrigated. Irrigated in one season gave 8.4 per cent. more than the unirrigated.

The New Jersey Experiment Station in 1900 published the results of irrigation for several kinds of vegetables made by George A. Mitchell.

"Cabbage. The net income from the irrigated quarter of an acre was $20.20 or $80.80 per acre; from the unirrigated, $15.39, or $61.56 per acre. The cost of irrigating one acre of cabbage three times was approximately $2.50. The capacity of the plant was sufficient to irrigate 20 to 30 acres of cabbage; thus the profit from irrigation on 25 acres of early cabbage at this rate would have paid for the plant. The yield was small owing to the charac-

ter of the soil. The gain was 31.3 per cent. A gain due to irrigation of over 30 per cent., when applied to soil of good character, would show much greater profits than in this case."

The following table gives the results from other vegetables irrigated by Mr. Mitchell: —

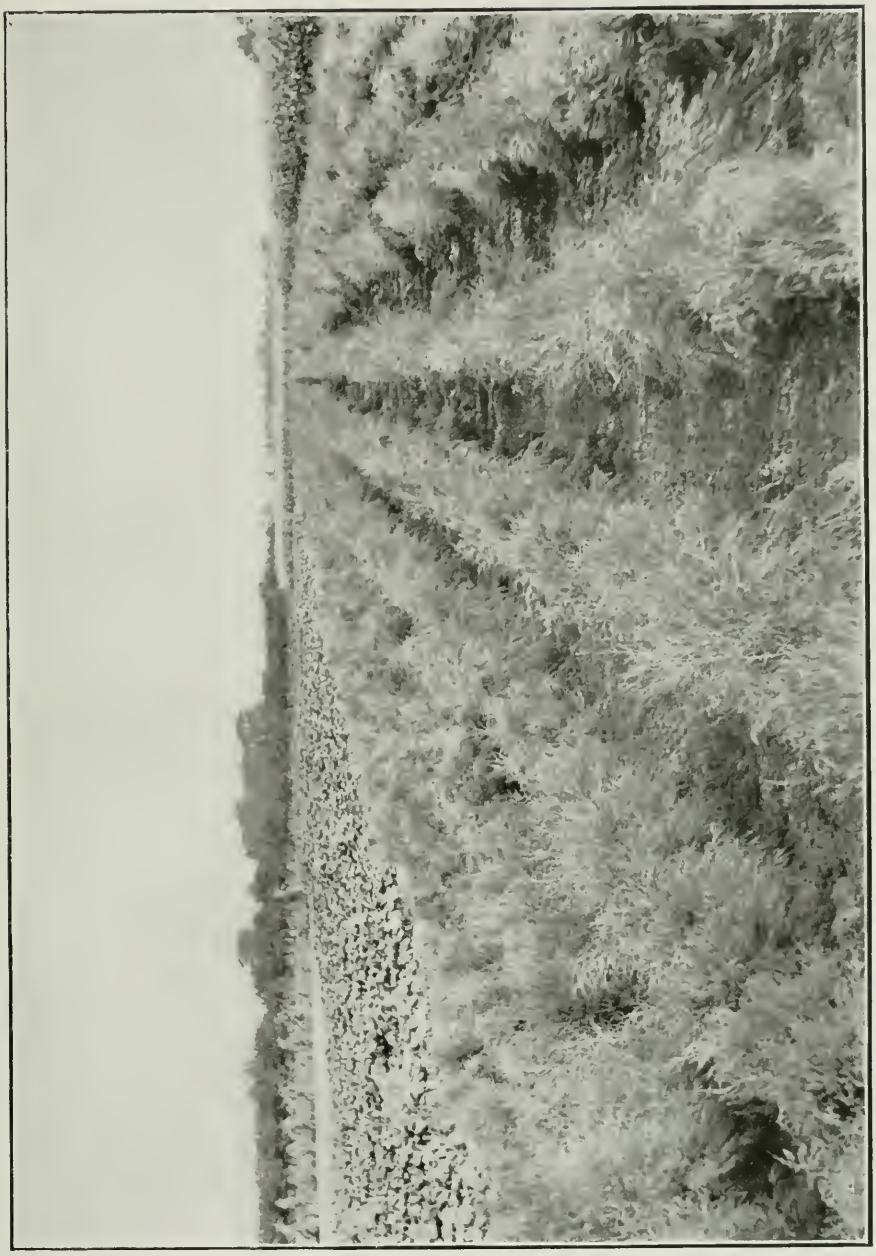
Dates of Planting and Irrigating and Yield of Crops.

Crop.	Date of planting.	Date of Irrigation	Irrigated.	Unirrigated.	Increase due to Irrigation.
					Per cent.
Corn	May 6	June 2 " 16 July 3	373 pounds, dried stalks	400 pounds, dried stalks.	No gain.
Sweet Corn	May 6	June 2 July 3	440 ears (406 lbs.)	325 ears (288 lbs.)	35.3 40.9
Sweet potatoes	May 8	June 2 " 16 July 3 Sept. 8	423 pounds, prime	245 pounds, prime	72.6
Lima beans	May 8, replanted	June 2 July 30 Sept. 8	270 pounds, pods	218 pounds, pods	23.8
Tomatoes	May 23	June 2 July 3	547 pounds, prime.	573 pounds, prime	No gain.
Watermelons	May 6, replanted	June 2 " 16 July 3	74 melons (1198 lbs.)	54 melons (830 lbs.)	37.0 44.0
Cucumbers	May 6, replanted	June 16 July 3	176 pounds	210 pounds	No gain.
White potatoes		June 7 " 16	322 pounds, prime.	236 pounds, prime.	36.4
Bush limas	May 27	June 2 July 3 Sept. 8	74 pounds, pods	68 pounds, pods	8.8

The following tests with small fruits were made: —

Blackberries and Raspberries. "With blackberries, Eldorado has proved the most productive sort, for a period of four years, followed by Erie and Agawam. Arranging the results secured with irrigation for four years, the largest early yield has been obtained on the unirrigated plots, while the total yield has been about 13 per cent. larger with irrigation. The use of nitrate of soda has resulted in increased yields on unirrigated plots, but where irrigation was practised the yields were the lowest obtained. Irrigation has increased the early yield of raspberries 15.3 per cent. and the total yield about 5.4 per cent. The use of an extra amount of nitrate of soda has not benefited the crops."

In 1898 and 1899 the increases were much greater than the average for four years, for taking the average price of blackberries for the two years at 9 cents per quart "the increased value per acre of the berries on the irrigated plots ranged from $65.16 for Wilson Jr., to $219.96 for Eldorado, or averaging all the varieties for both years, we have a gain from irrigation of 53.8 per cent. or 1,038 quarts per acre, worth $93.42. In the case of raspberries the increase from irrigation in 1898 and 1899 was also greater than for the average of four years, for with the exception of Turner in 1899 there is an increased average yield from irrigation of all the varieties for the two years, ranging from 468 to 621 quarts, which at 10 cents per quart shows



Field of Argenteuil Asparagus.

Grown by W. C. McCalla.

a gain of from $46.80 to $62.10 per acre. Including the Turner, the average gain for all is reduced to 19 per cent., making 329 quarts, worth $32.90 per acre."

Currants. "The average increase in currants for five years, due to irrigation, has been 10.76. During four years it averaged over 15 per cent."

Gooseberries. The average increase for five years was 3.3 per cent. For four years it was a little over 7 per cent.

Strawberries. The average total yields for five years have been greatest in the unirrigated plots. For the first four years irrigation was beneficial in slightly increasing the early yield only. One season the irrigated plots gave 11 per cent. more than the unirrigated."

The above results are sufficient to show that in some cases irrigation is beneficial and that in others it is not.

A number of letters were sent out recently to persons in the Eastern States and Ontario, Canada asking for information in regard to the irrigation of vegetables and small fruits.

Following are some of the replies:—

New Brunswick, N. J., Oct. 30, 1908.

Water is furnished free, and we find irrigation of much assistance. For example, the season just passing was dry, and the pepper, egg-plant and squash crops were saved by watering. There was nearly an acre in tomatoes, and, as a commercial crop was not sought, an experiment was made of the effect of drought upon them, nevertheless, water was occasionally applied in places where too great a loss would be incurred. The above is enough to show that the Experiment Station believes in irrigation.

(Signed) Byron D. Halstead.

Leamington, Ont., Nov. 3rd, 1908.

There has never been any irrigation practised here. I am the only person who has used water to any extent outside, and that only in a small way.

For about ten years I have had a 200-barrel tank elevated about twenty-five feet; have pipes laid through greenhouses and two leading out twenty rods or so, where I grow chiefly cucumbers, but we pour the water on through an inch hose, using about twenty barrels per hour for three or four hours, say, three times per week, and in that way getting over them once per week. We have to do it in this way to get best results, as we do not like to begin until about five o'clock p.m. I use a windmill chiefly; when necessary, I attach a gasoline engine.

One of my neighbors uses a gasoline engine to raise water from the lake, used chiefly in greenhouse and cold frames. We have both tried applying it with the hose on strawberries, which is very satisfactory in a small way.

(Signed) J. L. Hilborn.

Mr. H. R. Rowsome, of Burlington, Ont., this year irrigated two acres of celery, with a two horse-power gasoline engine, drawing water from the lake, a distance of 400 feet, with a lift of 21 feet, applying 30,000 gallons in fifteen hours in one application. Mr. Rowsome says he has two acres of extra good celery, whereas if he had not irrigated his crop would be practically worthless, and figures that he has paid for his pumping plant in the results he has secured this season.

(Signed) A. McMeans.

Agricultural Experiment Station,
Kingston, R.I., U.S., Nov. 4th, 1908.

The method of irrigation commonly used here is sprinkling the plants from a hose. Some of the growers buy their water direct from the town or city supply, while others pump from nearby streams. In either case the water is usually distributed through temporary iron pipes laid a few inches under the surface of the ground along the driveways, to which openings are attached at intervals of about 100 feet, so that hose connection can be made thereto. Three-inch hose is the size quite commonly used, the water being distributed from an inch and a half nozzle.

The market gardeners located upon the type of soil previously mentioned would consider it practically impossible to grow crops throughout the entire summer without the aid of water furnished by irrigation.

(Signed) G. E. Adams.

Planting.

Photo by H. Broughton.

Turnips after Potatoes and Strawberries.

WESTON, ONT., Nov. 7, 1908.

A neighbor of my own some years ago irrigated several acres of onion and potatoes by damming up a trout brook that crossed his property and flooding the patch. He got a large crop of very fine onions, but it didn't seem to agree with the potatoes. We supposed it was because the water was too cold. He continued it for several years with practically the same results. Subsequent tenants of the property have not used it. These are the only cases that I know of where it has been attempted systematically.

The general impression seems to be that it is "no good." My own opinion is that very much depends on the nature of the soil, particularly the subsoil. If that be open and porous and an abundant supply of water easily obtainable at small cost, all right. A small quantity carelessly applied will, I think, do more harm than good, and a large quantity ditto unless you have proper means of removing surplus.

(Signed) THOS. DELWORTH.

PHILADELPHIA, Nov. 7, 1908.

We are not growers of vegetables or small fruits for the market, but have used the Skinner system of irrigation with excellent results in various of our field cultures, principally on hardy perennials and similar stock during the past four or five summers. We are unable to furnish you with an estimate of the proportionate increased valuation of the stock due to this irrigation, but can state that we layer during the months of July and August many thousands of strawberry plants which we sell at that season of the year as pot-grown plants. Before the installation of the irrigating system our losses during unfavorable weather were frequently from twenty to forty per cent. Since installing the irrigation plant there is practically no loss at all. We believe it to be a profitable investment in our uncertain climate. We have tried many different methods of irrigating and found the Skinner system to answer our purpose most satisfactorily.

(Signed) HENRY A. DREER.

CONCORD, MASS., Nov. 7th, 1908.

I have only used irrigation for the growing of strawberries, more particularly the plants, but as I fruited some of the beds on which I grew plants I had a chance to see some results from irrigation. The system that I have used is the Skinner. Of three other methods of irrigation which I have tried this is far the best for fruit or vegetables. On half an acre under irrigation from plants grown in hills I picked more than two quarts per plant, while matted rows not irrigated would not produce more than one-quarter of a quart per plant. This was not all due to irrigation, but the plants were greatly benefited by the water.

(Signed) WILFRID WHEELER.

VINELAND, N. J., Nov. 13th, 1908.

We irrigate our crops, and it pays. We pump our water with a gasoline engine, and carry water in iron pipes and distribute by means of sprays. We established our plant about eight years ago and have used it since, but we keep no account of increase. We simply get the crops and are well satisfied with results. You can simply double, treble, or quadruple your crop, according as you fertilize and cultivate.

(Signed) DAVID ASTLE.

W. W. WEAVER: I tried irrigation on a plot of potatoes and sugar beets of exactly the same dimensions, and laid off two small plots and kept them separate this year. The potatoes yielded nearly twice as much on the plot that was irrigated three times, as that which had not been watered. While the beets were not affected as much as the potatoes, the yield was increased 30 or 40 per cent.

A MEMBER: I would like to ask Mr. McMeans if he did not conduct an experiment inside the greenhouse?

A. MCMEANS: I did some sub-irrigation work on lettuce and had fairly good results. On the other side they put the water on in a fine mist that they call "The Skinner System." This system costs to install about $75 an acre, not counting the posts. It is used largely in Carolina for frost protection. If there is any danger of frost they set the engine working. They use a boiler to heat the water up to 70 degrees and it is distributed on the crops. They have had celery coated with an inch of frost and it has come through all right.

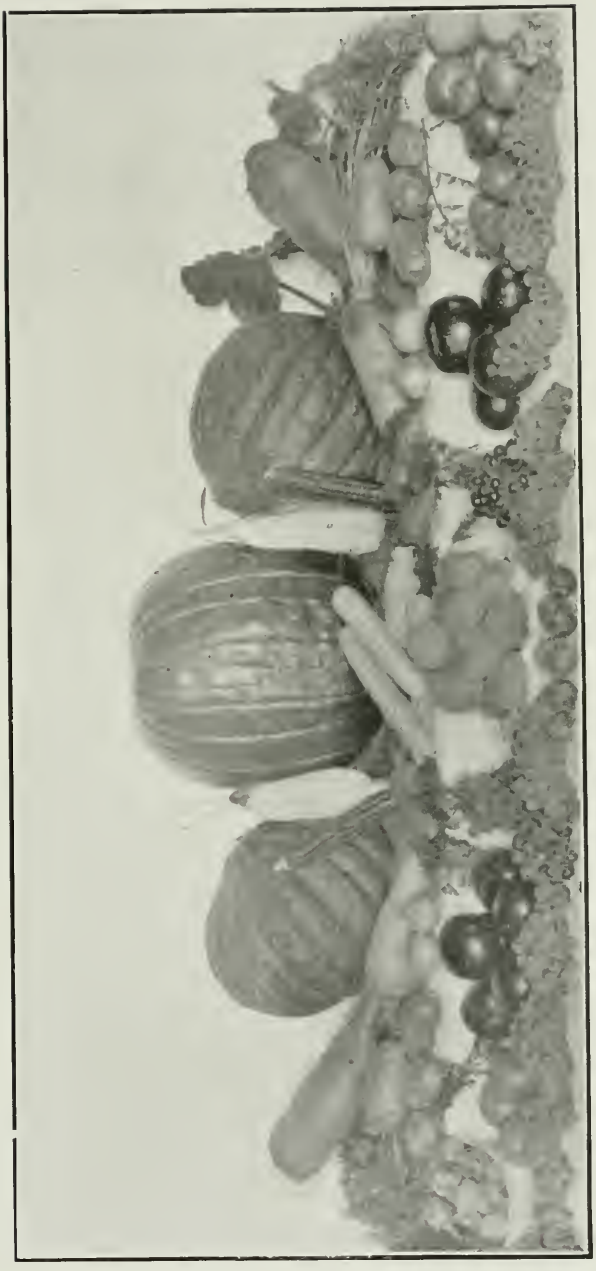


Photo by W. C. McCalla.

Autumn Products of "Sunny Acres."

ADDRESS.

By Hon. James S. Duff, Minister of Agriculture, Toronto.

It affords me a very great deal of pleasure to be with you for a short time this afternoon, and to take part in your deliberations. My appointment, as you know, is of such a recent date that I find some difficulty in taking care of all the work that falls to my lot. Another year, however, if all is well, I may have a little more time at my disposal to take part in the discussions of the organizations which you and your allied institutions represent. Of all the associations which meet this week in Toronto, yours is in many respects the most important. We can get along to a certain extent without fruits and also without flowers, if necessary, but it would be pretty hard lines if we could not obtain vegetables. With the growth of our cities and towns in this Province at the present time, and with the outlook that we have in this young country, it seems to me that there are no organizations that will have greater work before them and which will have more far-reaching results, than yours.

I am glad to find that at this, your fourth annual Convention, you have such an excellent programme. Although I have not been identified with many of the movements of this nature, yet I have had the honor to have had a seat in the Legislature for many years, and I represent a rural constituency and am a farmer myself, and have kept in touch with what was going on in connection with the various associations which you and others represent, and which are all allied to the great Agricultural interests of ths Province. I have not said too much when I speak of the very important work you have in hand. I watched with very much interest some time ago when the vegetable growers of this Province were asking for protection, and noted the discussions that took place at that time. I was pleased to note in the report of your President that he congratulated the Association on the fact that the measure of protection extended to you by the Dominion Government at that time had been of very great benefit. It occurred to me that it was a great injustice that at the time when your produce was ready to go on the market you were handicapped because of vegetables coming from the other side and competing with you in the market that you had established, and which you had arranged to supply by your own hard labor.

There is another point I would like to allude to. I spoke of the fact that your deliberations were far-reaching. The way to make them still more so is to take the important findings in your experiments, boil them down as concisely as possible, and have them printed and distributed, not only to the vegetable growers that are identified with your association, but to those in the neighborhood of every town in the Province. I know men who live by market gardening throughout the County of Simcoe, and any information in the way of experiments for decreasing insect pests, increasing the average yield, or finding out which of the many varieties of vegetables is the better, scattered amongst these people will be of great benefit to them, and to farmers in the country who grow their own vegetables. In that connection you cannot estimate the value that will come to you in reference to your work. I yesterday received a letter from a friend of mine in New York, in which he asked me to send a bulletin on vegetables, and all the information I could forward, to a gentleman who operates a large farm on your lines in the State of New York. This shows that if you did not have this organization, and

this annual convention—if you did not have these opportunities of coming in touch with each other—you would not be in a position to afford the Department the information of which I have just spoken. I am satisfied that the average farmer in the country loses half his vegetable crops from the ravages of insects. We have great trouble endeavoring to grow cabbages and many other vegetables, and the greatest possible interest should be developed, and every effort put forth to eradicate insect pests.

The same thing is true with regard to small fruits. I heard the paper read by Professor Macoun this afternoon, and I found your addresses dealt not only with the interests of the vegetable growers, but also those of the small fruit growers. That is another branch of industry in this Province that is bound to increase year by year.

Take the City of Toronto alone, it is growing by leaps and bounds, and what is true of Toronto is true of all our centres in every part of the Province; even our small villages are growing. In fact there is no trouble at all about growth of the urban population. This is increasing very fast. It means that although many of these people in the small centres may have gardens, yet the greater number of them must depend on the market gardener and small fruit grower for what they require for their tables.

I can assure you the Government of which I have the honor to be a member takes the greatest possible interest in all your work. We may not be able to do all you ask us to do, or to make as large a grant as you might wish. You have not asked for any increase yet, and, if we cannot grant you all you may think you require, it will be simply because of the situation in which we find ourselves financially. I know there has been a very large increase in the amount set apart for agricultural work by my predecessor, much larger than in former years. The work and the grants inaugurated by him have my hearty indorsement, and, in doing so, I am sure that I will be backed up by the Government.

I am sorry I cannot remain for the afternoon, but I assure you that I shall watch carefully everything you do, and read your reports and everything in connection with your work. I would only repeat what I said before, make anything you say or give to the public as concise as possible, and let the people know the results of your investigations so that these will be of some use to them.

The PRESIDENT: We have received some good hints from the Hon. Mr. Duff, and will try to follow these out very closely during the coming year.

THE TARIFF ON VEGETABLES AND SMALL FRUITS.

By W. O. SEALY, M.P., HAMILTON.

The matter that I am going to deal with this afternoon is that of the tariff on vegetables and small fruits. I think tariff matters could be regulated and improved to our general advantage. We believe that it should be able to preserve the home market for home products along agricultural lines. The majority of the people in Canada are sincere in that belief and it is a question of how we can bring about these results. Manufacturers have secured protection for themselves, not by individual, but united effort, and by a plan and policy that seems to benefit, not only one particular line of manufacture, but the great majority of the industries of this country. As vegetable and small fruit growers you ought to get the support of every locality that

is represented here. Perhaps not more than ten or fifteen counties produce vegetables and small fruits to any considerable extent, and if you get the support of these for a protective measure, it might not succeed, and we should consider for a few moments how best to increase the support that should be given to such protection during the approaching Dominion Session. Manufacturers will have tariff matters up, and so will agriculturists. The vegetable and fruit growers are interested in too small an area, and it occurs to me that the general agricultural interests of the Dominion should be combined from east to west, and in that way we would copy to some extent the manufacturer in the matter of high protective tariff. The present duty is 2c. a quart, and, when strawberries are selling at 5 or 10c., 2c. would be 20 or 30 per cent., but none come in that time. The duty is collected on strawberries when they come in from the south and are $1 a quart, 50c. a quart, and so on. Two cents on these prices is a mere nothing. When strawberries are out of season it is largely the wealthy who are able to buy them, and as the tariff should be raised largely out of luxuries rather than necessities, it would be a proper thing to increase the duty on strawberries when they are luxuries. Cabbages and other vegetables would follow.

Farmers' Associations were live institutions all over the country a few years ago; they are not quite so active now. I believe it would benefit this Association to take a step in further organization along agricultural lines, and in that way get more support. The commission men of the West are organizing, and preparing to approach the Dominion Government to ask for lower duties on vegetables and fruits, and if that is not met by us fairly and squarely they may succeed. The commission men's interests are in common with the producers. The commission man does not handle a great deal of stuff that is being produced around here, but foreign vegetables that come in to be sold on commission, and therefore, he is anxious that as much foreign produce as possibly should be allowed to come in. If the tariff prevented that, it would only whet the appetites of those who wanted these things, and they would be more anxious for them, and you would be receiving 50c. and 40c. a quart where you now only get 15c. It is worth your while considering.

THE VALUE OF COMMERCIAL FERTILIZERS TO THE VEGETABLE AND SMALL FRUIT GROWER.

By A. McKenney, Essex.

The question of Commercial Fertilizers is one which appeals to the vegetable grower more and more as time goes on.

His object is to produce a large crop, which will mature as early as possible, so that he may get his vegetables upon the market at the proper time, and have them of the best quality.

In order to do this he is using large quantities of barnyard manure and will continue to do this until a better substitute is found.

There is no question about manure giving excellent results, but it has objectionable features. For instance, the cost of hauling often makes its use well nigh impossible, and, again, a continued use of large quantities of barnyard manure tends to unbalance many soils.

All the fertilizing constituents necessary for plant life are found in it, but continued large applications may increase the amount of nitrogen in the

soil to such an extent as to produce too rank a growth of vine in many cases, and not enough ripe fruit. Where conditions exist such as these it may be advisable to try an application of some fertilizer. Many vegetable growers hesitate to use commercial fertilizers from lack of definite information and experience.

Unfortunately it is a subject about which he can obtain very little valuable information, either from experiment stations or elsewhere, because although fertilizer experiments conducted by the vegetable growers in one section of the province might be successful, similar ones in another district might give contrary results, owing to differences in the kind of soil used, climatic conditions, etc.

It is always better in beginning the use of fertilizers to find out exactly what your soil requires. The proper method of doing this is to set aside several plots side by side. Upon plot No. 1 apply barnyard manure; No. 2, phosphate, potash and nitrate; No. 3, nitrate and phosphate; No. 4, nitrate and potash; No. 5, potash, phosphate; No. 6, in natural state.

In this way we should be able to find out just what fertilizing constituents a soil requires, and which gives the best results.

However, we should not be too hasty in condemning or accepting the results of these experiments.

During the past year we have been working upon a muck soil in the County of Essex. In the summer of 1907, which was particularly wet, one of the most enterprising onion growers upon this soil tried the experiment of scattering a fertilizer composed of phosphate and potash upon a certain section of his onion patch. He obtained most remarkable results, the onions upon the fertilized plot being the only ones in a field of five acres that ripened successfully, and were free from scullions. He calculated that he had increased his yield by at least 600 bushels per acre.

As the result of this one year's experiment with one plot, he applied fertilizer at the rate of 1,000 lbs. per acre in 1908 and obtained, practically, no results.

Several of this man's neighbors who used fertilizer in 1908 as the result of the experiment in 1907, are of the opinion that commercial fertilizers are worthless.

The facts are, however, that no commercial fertilizer applied in any part of the province gave anywhere near maximum results in 1908.

Ten different fertilizer experiments of four plots each, conducted by the Ontario Department of Agriculture upon muck soils in the County of Essex gave very conflicting results. This was, we think, entirely due to the remarkably dry summer of 1908. It is the intention of the Department to continue these experiments for a period of five years upon the same plots, when we hope to be able to give you much more definite information regarding this kind of soil than I am able to give you to-day.

In conclusion, I may say that commercial fertilizers certainly have their place upon the farm of the vegetable grower, and under the conditions mentioned in the beginning of my address will prove of value.

But every man should determine for himself, by experiment, exactly what fertilizers give the best results upon his own soil, and he should extend this work over sufficient time upon the same soil, in order to make sure that results were not influenced by climatic or other conditions before either condemning or accepting these.

I. A. Farquharson: I am glad to hear one speaker on fertilizers who says that he does not know much about it. The best fertilizer I ever found was good stable manure and plenty of it. Keep down the weeds and use the

cultivator and the hoe. My experience is that it requires several years to test any of these fertilizers. Last season I had excellent results with all I used, but this year where I spent most of my money in commercial fertilizers I had the poorest results.

T. Delworth: This year I used two sacks of a commercial fertilizer. The company sent it to me free of cost, and asked me to use it. I planted three-quarters of an acre of cauliflower, and used it on half of it. I could not see any results whatever, and at the rate I applied it, it would have cost me $30 an acre.

F. F. Reeves: My experience has ben something similar to Mr. Delworth's. My advice to any one who thinks of trying commercial fertilizers is not to do it. Two years ago I tried an experiment with celery using five different fertilizers. The trial plots were two rods long with two rod checks between, and you could not tell where the fertilizer had been until you looked up the pegs marking where it had been used.

Last year I tried it on cabbage and cauliflower, at a rate which would have cost me $50 an acre, and I could not see any difference in the crop. This year I followed up with tomatoes. I could see a difference in the tomatoes. This year I tried it on onions, and it was a total failure, and the next man who tries to make me buy will not be successful.

J. W. Rush: I had experience with fertilizers for a good many years. Sometimes they are a benefit and sometimes otherwise. Last year I tried them with celery. I planted it 12 inches one way and 6 another. They were pretty fair plants, grown in flats. On the first of June we put on the first application of fertilizer. We hoed it in nicely and got the ground clean. We applied it three times. During the first week in September I went out to see the crop, tied up three bunches of it and sent it off with a little description of the growth and the way we applied the fertilizer. I never saw celery grow quicker and better, and this year I thought I would have some pretty good stuff and applied the same fertilizer in black muck, but had poor results. No doubt it was owing to the season.

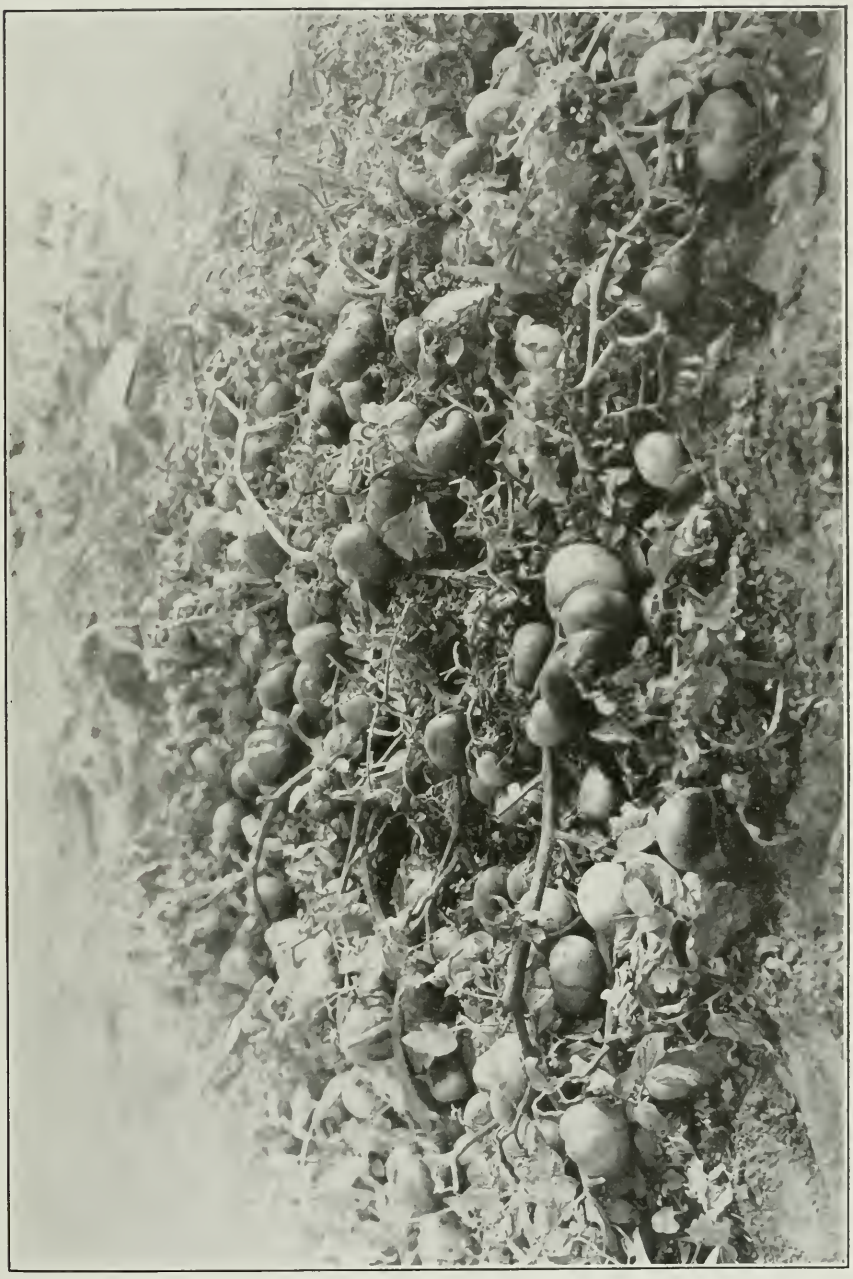
TOMATOES.

By A. G. Turney, Guelph.

About the beginning of last August I was apointed to investigate the tomato industry of this Province. The investigation is simply the result of inquiry and observation, and has nothing to do whatever with practical experience. I will first give you an idea of the extent of the industry as I find it in this Province. By far the larger area is devoted to producing tomatoes for the canning factories. In 1891 there were about 800 cars of canned goods shipped; last year this increased to about 8,000; from 1904 there was approximately 3,000, so that it has increased 5,000 cars in the last five years.

History.

The tomato plant is of South American origin, and was apparently cultivated there for many years prior to the discovery of the country by Europeans. As early as 1554 we find that in Europe certain varieties of tomatoes have been described. From that year to 1860, fifteen distinct varieties were described and we have records of tomatoes being successfully produced under glass in Europe in 1820.



A typical Earlianna Vine.

The first mention on this continent of the tomato being grown for culinary use was in Virginia in 1781. During the following twenty years futile attempts were made to popularize the use of the fruit. However, it is on record that the fruit was regularly quoted on the market in New Orleans in 1812, and that the seed was first offered for sale as that of an "edible vegetable" six years later. From that time on the increase in its popularity and culture has gradually proceeded, until to-day the tomato ranks with the more common fruits found on the markets of this continent, either in the natural or canned state. But while the majority of these more common fruits have been in great demand for some decades past, yet the same cannot be said for the tomato, for it is only during the past few years that it has assumed such a prominent place in the list of necessary articles of food.

Recent Growth of the Industry.

By far the larger portion of the area devoted to the crop is employed in supplying fruit for the canning factories, and it is the demand of these canning factories which more than any other factor has, during the past few years, supplied the great impetus to tomato culture.

As an article of trade canned tomatoes were first introduced on this continent in 1848, by Harrison W. Crosby, Steward of the Lafayette College, Easton, Pa. The cost then was fifty cents per can. Since that time the cost of producing the finished article has decreased steadily, whilst the output has increased enormously, and to-day three-lb cans of tomatoes can be bought retail for nine and ten cents.

Some idea of the increase in the extent of the business during the past few years in the United States and Ontario may be obtained from the following record of the total output in cases of twenty-four 3-lb. cases:

	United States.		*Ontario.*
1887	2,800,000	1887	.....
1891	3,322,000	1891	83,000
1892	3,223,000	1892	144,000
1903	10,500,000	1904	310,000
1906	.....	1906	793,000
1907	13,000,000	1907	575,000
1908	.....	1908	875,000

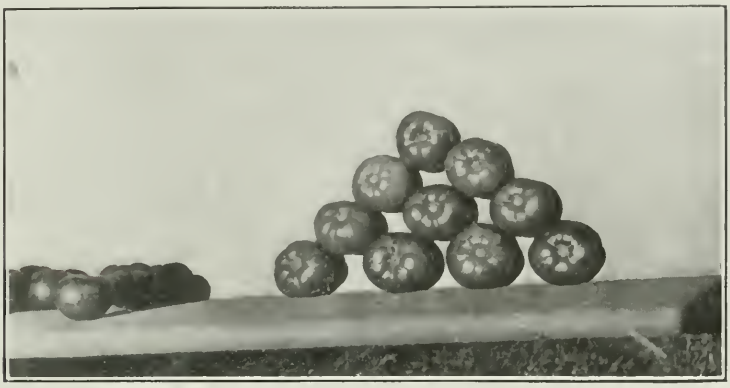
A still better idea of the growth of the industry in Ontario may be obtained from the following statements: The acreage under production for the canning factories has increased from 800 in 1891 to approximately 8,000 in 1908. For the same period, the total number of bushels paid for by the canning factories has increased from 132,000 to 1,400,000, the cases from 83,000 to 880,000, the cans from 1,992,000 to 21,124,000, the value of the pack from $190,000 to $1,672,000, and the price paid to the growers from $26,400 to $386,600; and during the past five years the number of factories packing tomatoes has increased from twenty-seven to fifty-three.

The Production of Canning Tomatoes.

In Ontario the canning of tomatoes upon a commercial basis dates back some twenty-seven years. In 1881, Messrs. Wellington Boulter and Gilbert Barker erected and started into operation canning factories at Picton and Bloomfield in the county of Prince Edward. To these men then belongs the

credit of pioneering an industry which, in the comparatively short period of a quarter of a century has made such a remarkably rapid growth.

The districts in this Province producing canning tomatoes, or what is commonly known as the main crop, naturally fall into four districts, viz: Prince Edward County, which is practically an island on Lake Ontario; Eastern Ontario, exclusive of Prince Edward County; Western Ontario and



Plentiful. Pink variety.

Earlianna.

Southern Ontario. The following table compiled from 1906 figures will indicate somewhat the comparison between the districts.

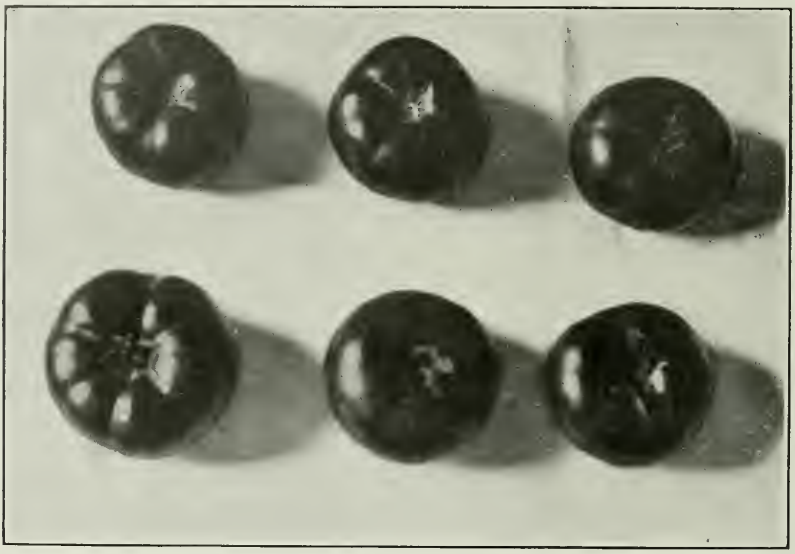
District.	Acreage.	Total Yield.	Average Yield.	Total Cases.	Price paid to growers.
		Bush.	Bush.		$
Prince Edward County.....	1,950	414,000	212	245,600	103,500
Eastern Ontario.....	1,135	181,000	159	116,400	45,250
Southern Ontario	2,130	464.000	218	290,000	126,000
Western Ontario.....	1,570	237,500	151	142,000	59,375

Note: While 1907 figures are available, that year was a poor one, hence 1906 figures are given.

A glance at the list of factories canning tomatoes will indicate the towns they are situated in. Perhaps it would be well at this point to refer briefly

to the features of each district, although there is no vast difference between them.

Prince Edward County. Being practically an island, more southerly situated than the rest of Eastern Ontario, and containing considerable areas of sandy and light clay loam of good fertility, this district has become famed for the quality and quantity of its tomatoes. It is the pioneer county in the canning industry of the Province, and to-day boasts of twelve factories, all of which pack tomatoes. With a view to early maturity more seed selection has been practised in this district than in Eastern and Western Ontario and the county boasts of as high an average yield as the famed Niagara district, in 1906 the average going over 200 bushels to the acre. The plants are largely grown by experienced and conscientious greenhouse men and sold to the farmers, hence a better class of plants is produced. This fact, together



Stone.
Bolgiano's Best.

with more years of experience and more attention to detail largely accounts for the superiority of this district over Eastern and Western Ontario.

Eastern Ontario. This district extends from Napanee to Oshawa, some 100 miles, a length almost equal to that in the Western Ontario district, but on account of its more northerly and eastern situation the area of land suitable and used for tomato growing is confined to the narrow strip on the lake shore and the actual acreage is only one-half of the other districts and supplies but seven factories. In point of average yield it equals Western Ontario, but falls considerably below the other two districts. The causes for this lower yield are attributable to a poorer supply of the young plants; in a few cases to a want of confidence between the grower and the canner leading to slovenly methods and in general to the sowing of the crop upon soils not very favorable to its culture, without any attempt to counteract the disadvantage by special attention to detail. Since the causes for failure apply to all four districts it will be better to deal with them later on under a separate heading. Cutworms have caused considerable loss to the growers in Eastern Ontario and Prince Edward County.

Southern Ontario. Southern Ontario comprises the district in the neighborhood of Hamilton, together with the strip of land extending from that city to Niagara Falls and lying between the lake shore and the mountain, and also a small section around Dunnville. In point of number of acres grown in conjunction with the average yield it is the first of the four districts. It contains eighteen factories which pack tomatoes, but the number would not be so large except for the presence af abundant fruit. Of the four districts the climate of this one approximates nearer to that of the native home of the tomato; the soil is for the most part very favorable and in many cases where the crop is grown as a filler in newly planted orchards, the soil is exceedingly favorable to the production of a high quality and quantity. As in Prince Edward County stockier, hardier and better grown plants are used, and more constant cultivation is practised, the result being evidenced in the higher average yield.

Western Ontario. This district extends along the line of the G.T.R. from London to Windsor, and includes a number of favorable sections lying to the south between the railroad and the lake shore, the county of Essex and sections around Alvinston in Lambton County, and Dresden in Wallaceburg in the north of Kent County. There are thirteen factories in this district. Many of these are of recent origin and in starting up these factories in new districts the owners had to contract with inexperienced growers with the result that the average yield is lower than climatic and soil conditions alone would account for. In Southern and Western Ontario cutworms do not appear to have been any like so formidable as in the Eastern districts.

Producing the Main Crop.

General methods of production followed throughout the Province:—

The young plants are either procured from professional growers at prices ranging from two to ten dollars per thousand, or are grown by the farmer himself. In the first case the seed is started in greenhouses, and the plants grown there the majority of the time, being generally hardened off in cold frames. If grown by the farmer the seed is sown in hotbed and pricked out into cold frames. When about six weeks old the young plants are transferred to the field, the date of this transplanting ranging from May 21st to June 12th and depending largely on the business methods of the grower. The soil upon which the crop is to be grown generally receives an application of from eight to twelve loads of well rotted manure, which is usually plowed under in the fall. A number of growers prefer to manure the previous crop and aim to plow both in the fall and spring. If the soil is light and quite porous, most growers work the manure in from the surface, believing that by so doing they lose less of its fertilizing elements.

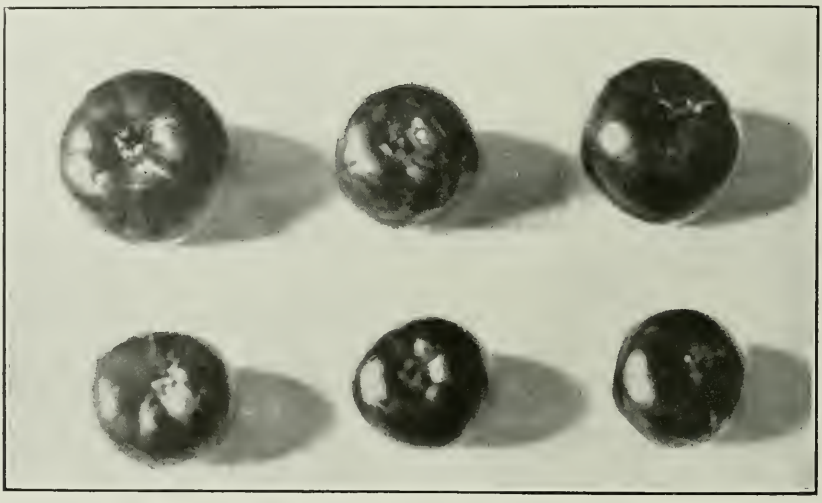
In the spring the ground is more or less efficiently worked up with disc and straight toothed harrows. When planting time arrives the field is marked out with a corn-marker usually 4 feet by 4 feet, sometimes 4 feet by 5 feet, 5 feet by 5 feet and 3½ feet by 5 feet. The spade and furrow systems of planting are both used, the former being much more general. Some few hours before the plants are to be taken from the cold frames they are well watered, thus when the time arrives they are cut around with a sharp spade and the soil being fairly moist a good chunk of it adheres to the roots of each plant. In this way they may be transferred to the field with a minimum disturbance of the roots and the least possible wilt. When set in the field if the soil is dry, water is applied, about two quarts per plant.

The growers generally aim to give the first cultivation on the preceeding day or within two or three days after setting. The best growers culti-

vate after heavy rains to prevent baking of the soil and throughout the season will cultivate in all about four times each way using the spring tooth or other form of one horse cultivator. With few exceptions the crop is only hoed once, this generally being done shortly before the size of the plants renders horse cultivation detrimental. Harvesting lasts from the middle of August to the middle of October. The first pickings being light are gathered in baskets and afterwards placed in bushel crates. Later pickings, when the ripe tomatoes are numerous, are gathered right into crates. The number of crates hauled to the factory at a time depends largely on its proximity and the area under crop.

Cost of Production.

It would seem to be one of the first, if not the first, essential of profitable production that the cost of producing the article upon the sale of which



Jack Roe.
Earlianna.

we depend for a profit should be definitely known. But it is a well known fact that of the various foods raised for human consumption probably the least is known concerning the cost of producing those crops raised on the ordinary farm. While this may, to some extent, be accounted for by the nature of the business, so largely affected by individual circumstances, yet in the main it must be credited to a lack of application of business principles to practical agriculture. The men to-day growing tomatoes for the canning factories who have kept any reliable track of their cost of production may be counted on the fingers of the two hands. Again if a grower who has not kept track of the cost of production is pressed to place his estimate on the expense item by item he becomes alarmed at the large acount he is running up, and almost invariably places some ridiculous estimate upon certain items, thus lowering the actual cost. From that standpoint he refuses to recede and his estimate therefore loses in reliability.

Of the cost of production of tomatoes even so great an authority as W. W. Tracey says: "Under usual conditions the growing of an acre of tomatoes and the gathering and marketing of the fruit will cost from $18 to $90." From this statement, and from the fact that a host of conditions

of the soil, location, labor, and proximity to markets combine to render the cost of producing this crop very variable, it is impossible to quote an estimate, or estimates that will agree with all the different conditions prevailing throughout the Province. It should be plainly borne in mind that the following figures deal wih the cost of production as incurred by the ordinary farmer growing tomatoes for the canning factories, as we find them in Prince Edward County, Eastern and Western Ontario and to a lesser extent in Southern Ontario, for in this latter district the price of land often runs considerably higher and thus the cost of production is increased. These figures have nothing to do with the cost of raising early tomatoes and do not apply so much to market gardeners. From records kept by a few growers and assuming average conditions to prevail, with the aim of pro-

Success.
Greater Baltimore.

ducing at least 400 bushels to the acre, the cost of production would be as follows:—

	Estimate No. 1.	Estimate No. 2.
	$ c.	$ c.
Rent of land	5 00	5 00
Eight two-horse loads manure	6 00	6 00
To applying same	4 00	2 50
To 250 lbs. fertilizer	4 00	4 00
To applying same	1 00	1 00
Plowing, Harrowing, Rolling, Marking	5 00	3 15
3,000 plants	10 00	10 00
Setting plants	4 00	4 00
Cultivating 5 times each way.		
2 times twice in a row	3 00	3 50
3 times once in a row	2 00	
Hoeing once	1 00	1 00
Pulling weeds	50	50
	45 50	40 65

In Estimate No. 1 the cost of a man for one day has been placed at $1.50, one man and one horse at $3.75, and a man and team at $4. At the time of season when this labor is required it cannot be obtained for less than the prices quoted. However, many farmers argue that the actual cost is not as great to them, and place their estimate of cost of one man and a horse for a day at $2, and a man and a team at $2.50 per day. On this latter basis an estimate, No. 2, is also given, showing the difference it makes to the cost of production and profit.

Profit According to Estimate No. 1.

	200 bushel yield	300 bushel yield	400 bushel yield
Initial cost	$45 50	$45 50	$45 50
Cost of picking at 3c. per bushel	6 00	9 00	12 00
Cost of hauling at 2½c. per bushel	5 00	7 50	10 00
Total cost	$56 50	$61 00	$67 50
Amount received at 27½c. per bushel	55 00	82 50	110 00
Profit per acre	$1 50*	$21 50	$42 50

* Loss

Profit According to Estimate No. 2.

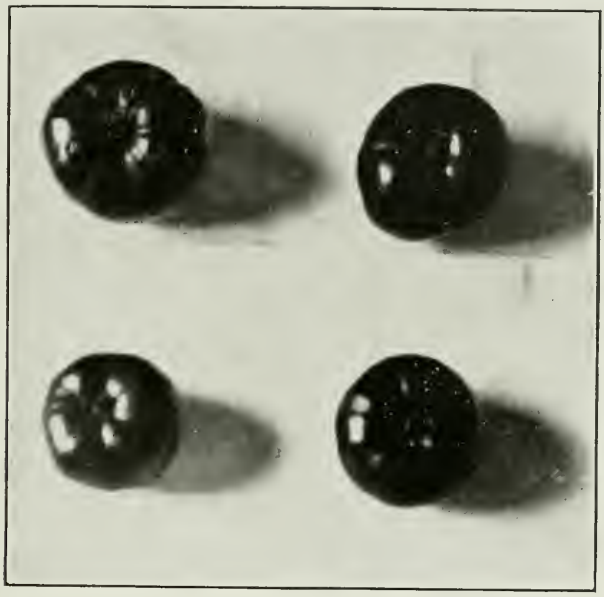
	200 bushel yield	300 bushel yield	400 bushel yield
Initial cost	$40 65	$40 65	$40 65
Cost of picking at 3c. per bushel	6 00	9 00	12 00
Cost of hauling at 1½c. per bushel	3 00	4 50	6 00
Total cost	$49 65	$54 15	$58 65
Amount received at 27½c. per bushel	55 00	82 50	110 00
Profit per acre	$5 35	$28 35	$51 35

There are some sections of the Province, to wit, in portions of southern Ontario and Essex county, where the price of land is higher, manure is more scarce and the crops grown are harder on the soil, thus increasing the items of rent of land and manuring or fertilizing in the estimate of cost of production. Thus in some of these sections referred to, the cost of production might approximate to $75 per acre. It may be argued that the total cost of manuring should not be charged to the crop of tomatoes alone. This may be so, but in order that due allowance may be made, a thorough knowledge of the individual conditions and the rotation of crops practiced in each case is necessary.

The Possibilities of the Tomato Plant and the Cost of Production in Relation to the Price Paid by the Canning Factories.

The average yield of the main crop in this Province is about 175 bushels to the acre. The actual yields vary all the way from 50 to 700 bushels, numbers of growers regularly producing 400 bushel crops. Estimating the

cost of production at from forty-five to fifty dollars then the average yield is bringing the grower no profit whatever. A 300 bushel yield costing to produce $61 is bringing the growers a profit of $21.50 per acre. A 400 bushel yield at the estimated cost of production of $67.50 is bringing a profit per acre of $42.50. Now the growers claim that the present price paid, viz., 27½c. per bushel of 60 lbs., is not enough, whilst the canners stoutly affirm that it is more than they can afford. The profits quoted are being obtained by men who are producing as other crops beside tomatoes, grains, roots, corn and potatoes.



Coreless.
Hummer.

The following table gives some idea how the profit obtained per acre from these different crops compares with those obtained from tomatoes:—

Crop.	Fair yield in bushels.	Price.	Value.	Cost of Production.	Profit.
Fall wheat	30	$0.94	$28 20	Since the cost of production for these crops is not definitely known, the profit from the yield of tomatoes compares very favorably with the total value of the yield per acre of the other crops.	
Barley	34	.55	19 25		
Oats	45	.40	18 00		
Peas	20	.87	17 40		
Beans	20	1.75	35 00		
Corn (in ear)	85	.....	....		
Potatoes	150	.75	112 50		
Turnips	350	.10	35 00		
Tomatoes	400	.27½	110 00	$67 50	$42 50

It is thus clearly seen how favorably the tomato crop grown on the ordinary farm in canning districts compares with the other crops. Even as far east as Prince Edward County a number of growers have expressed their

firm belief that the tomato is their best paying and surest crop. These men, however, have made a study of the crop and know their business pretty thoroughly.

Taking the average yield throughout the Province at 175 bushels per acre, then from what has already been said on the cost of production the present price, 27½c., is certainly not high enough, but if the price were raised, at 30c. it would still be inadequate. But we cannot expect the canners to set their prices so as to ensure even the most slovenly and indifferent growers producing very meagre yields, a fair profit. Whilst these latter at the present price paid are losing money, as already pointed out, others are reaping substantial profits, and are by no means discontented with existing conditions. As soon as the poor grower clamors for a higher price the canner immediately points to the successful grower as proof that the present price affords ample room for a good profit.

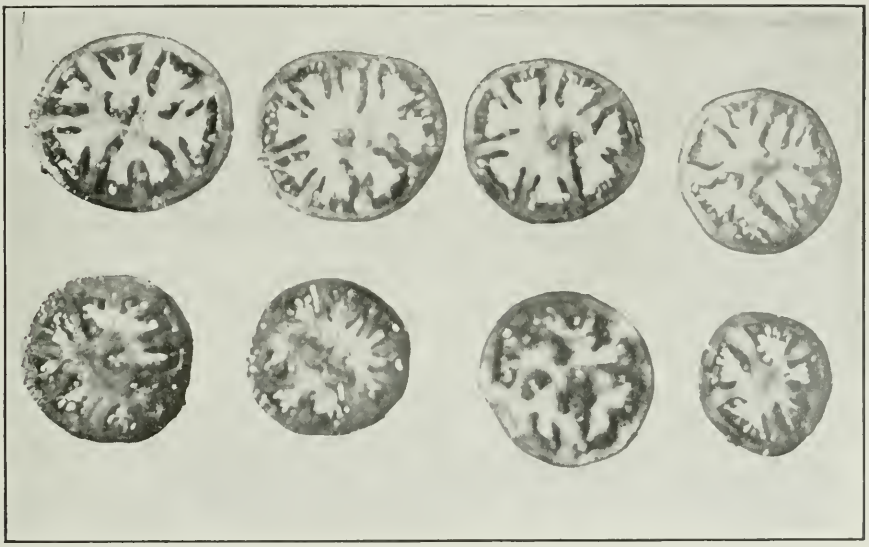
Again, we must admit that the tomato plant is capable of enormous yields, and has been known to yield in the field as high as 1,000 bushels per acre. As early as 1840 the Royal Horticultural Society of London reported the obtaining of over forty pounds of marketable fruit from a single vine. Even as far north as Guelph, this year, from plants not set out till June 10th, and harvesting ceasing on September 30th, twenty varieties were tested and gave from 26½ to 35½ pounds to the vine of good, sound, ripe fruit. Nine plants of each variety were set 5 by 4 feet and no special treatment accorded, and the figures quoted above are an average of the nine plants.

Perhaps it would not be fair to conclude this question without referring to the "risk" which so many growers claim is too great in the production of the crop. They claim that they are so largely dependent on the nature of the season and the length of it, as determined by the dates of early and late frosts. My investigations in the different districts hardly substantiate these claims. Under favorable conditions the tomato plant will develop from the date of sowing the seed to ripe fruit in from 85-120 days of full sunshine, with a constant day temperature of from 75 to 90°F., and 15-20°F. lower at night. Cloudy days and lower temperatures lengthen the period required for maturity in this country to such an extent that the time required is generally from 125 to 175 days, and more generally from 150 to 175. Allowing about forty-five days in which the young plants are being grown, and during which time they may be protected against frost, this leaves us from 100 to 130 days reasonably free from frost, in which to mature the crop. June, July, August and September are generally free from frost. If to this we add the last week in May, it gives us almost 130 days from the time of planting out. This is without counting on October at all. The season in the four districts is amply long, provided the weather is moderately favorable, and the proper attention has been given to the crop. The task of producing any crop or article of trade might be said to be just as great a risk if marked by lack of proper business methods. I have met plenty of growers who considered the season amply long, and who by seed selection have hastened the maturity of the fruit to such an extent that they always count on delivering their entire crop to the canning factory by the end of September, and this as far east as Prince Edward County.

Again, it is claimed that the contracts are in many cases altogether too favorable to the canner, safe-guarding him to the extent that in the event of a sudden glut of the fruit at the canning factory, combined with a shortness of labor or cans, he has the power to refuse as many loads as he sees fit, in some cases resulting in a loss to the grower of half his crop. Thus the contracts which are worded that the canner undertakes to receive the produce

of so many acres, not exceeding 200 or 250 bushels per acre, certainly do not encourage the grower to aim for a heavy yield. Such claims as these, whilst based on actual occurence, are exceptional, and generally come from the poorer and dissatisfied growers. While the contracts are certainly not worded to safeguard the interests of the grower, yet as a matter of fact they exist only as a formal necessity, and are very rarely enforced. The really good growers are able to practically make their own terms. Quite a number of contracts are made by the bushel, not by the acre, and these are more favorable to the farmer, since if he contracts to supply 1,000 bushels, the amount of land from which he shall produce them rests entirely with him, and thus is a stimulant towards the maximum yield

There is perhaps one more phase which should enter into this question, but which I am not prepared to discuss here, and that is the comparative



Greater Baltimore. Success. Stone. B.B.
Jack Roe. Earlianna. Hummer. Coreless

Cross Sections.

profits derived from a bushel of tomatoes by both grower and canner. All things considered the growers should certainly receive 30c. per bushel, and if they can obtain this price then they should be satisfied. Those who cannot reap a profit at that price should be content to leave the business to more careful and progressive growers. The chances of obtaining this rise in price in the immediate future are, because of lack of co-operation, not very bright.

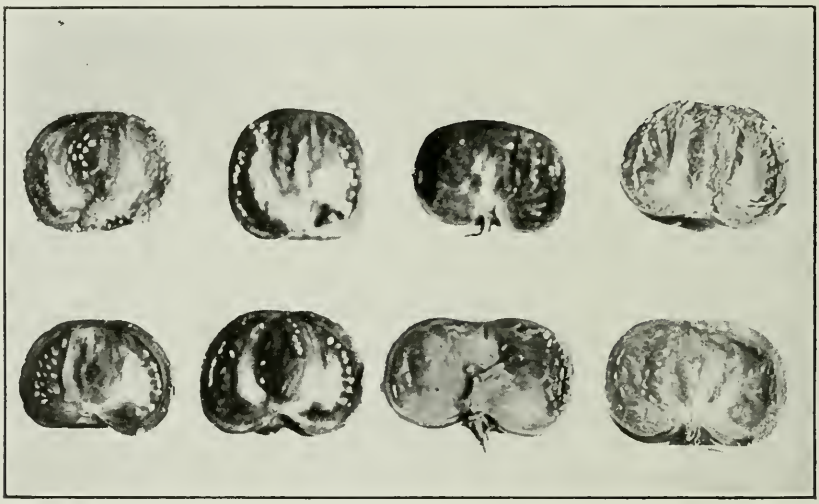
Some Points to be Considered in Growing Tomatoes, Showing Wherein Lie the Causes of Failure.

Location: While of considerable importance in the production of the early crop, this consideration does not so largely affect the main crop. Southern slopes and suitable spots affording shelter from too great exposures, as far as is consistent with the rotation, might be taken better advantage of. It is advisable to point out here that too many indifferent growers are rais-

ing their tomatoes five and even six miles from the canning factory, and the long and expensive haul thus incurred, largely affects the cost of profit of the crop. A minimum transportation expense is highly desirable, and should always be aimed at.

Preceding Crop.

The concensus of opinion throughout the Province favors clover sod, and this seems to be substantiated by the experience of United States growers, and, speaking in general, the best crops seen this summer were produced on clover sod. However, the choice of the tomato ground to a considerable extent depends upon the rotation of crops in vogue, and one cannot always sow on prepared clover sod. Whilst tomatoes have been grown successfully year after year on the same soil, and I have seen occasional fair crops so produced this summer, the practice is not to be commended, nor is the practice advisable of growing tomatoes on land which was in potatoes



Greater Baltimore. Jack Roe. | Success. Earlianna. | Stone. Hummer. | Greater Baltimore. Coreless.

Longtitudinal Section.

the year before, because both these crops are heavy consumers of potash, and considerably reduce the immediately available amount of that element in the soil. Failing a clover sod, the next best will be the second crop after clover, and of the other preceding crops, those of a leguminous nature are to be preferred.

Choice and Preparation of the Soil.

The best soil is a deep, rich, light loam, over a well drained subsoil. Such a soil gives chances for a maximum yield at a minimum expense, for it contains the necessary fertilizing elements in a readily available state, will drain and warm up quickly after rains, and being light can be cheaply worked, no small consideration in a crop demanding so much labor, and moreover, is not so apt to puddle under the frequent cultivations as is a clay. The fault to be found with many growers is that when they are forced to

select a soil not as favorable to tomato production as might be desired, they do not attempt to offset the disadvantage by seeking to improve its physical condition, and therefore its available fertility to better meet the requirements of the crop. Good crops can be produced on almost all kinds of soil—but these soils must have good tilth, fertility and drainage conditions, and no matter what the soil, whether light, medium or heavy, unless these conditions exist a large yield will not be obtained. The growers do not study sufficiently the plant they are growing. They do not know its characteristics. The roots of the tomato plant are very short and abundant, and can only gather the essential plant food and water from a very limited area. In contrast, the bean plant, while much smaller than the tomato plant, has an extensive root system, and thus a greater area from which to draw its nutriment. In addition to their shortness, tomato roots are exceedingly tender, and incapable of penetrating a soil in any way hard or compact. A knowledge of these characteristics shows us how essential to success is the proper treatment and preparation of the soil. Avoid soils with much clay in their make up, unless throughly underdrained, they are sure to be cold. I have seen fields of tomatoes which wouldn't begin to pay for the picking—the soils were clayey, poorly underdrained, and heavy rains early in the season had left the young plants standing for days in inches of water, spelling sure ruin to the crop. The plants thus treated make very little subsequent growth, and their fruits are very small and rot while still green.

Cultivation.

Here again is where a number of growers fall down. The best growers all emphasize the necessity for frequent cultivation, and this necessity can be readily understood when we realize that the period of the active life of the tomato root is short. The young plants, on account of their coarse open cellular structure, are at first capable of transmitting plant food and water very rapidly, but these transmitting media very soon clog up and lose their activity, hence the necessity for frequent cultivation in the early stages of growth. The most successful growers cultivate four or five times each way during the season, and aim to keep the surface soil in loose friable condition as long as possible. The more cultivation during the two weeks following the setting of the plants the better the results. Since the task of planting out must needs result in compacting the soil to a considerable extent, the first cultivation should take place the next day and be deep and thorough. I have been through field after field of tomatoes where the soil of a clayey nature has been hard as a rock, and consequently the plants were sickly looking, stunted things.

The Seed, its Source, Control and Selection.

Source: The bulk of the seed comes from the United States. A number of growers select their own seed in a more or less indifferent way. Only two men growing tomatoes for the seed value of the crop were met, Mr. G. H. Clark, at Leamington, and Mr. Maginnis, at London.

The price paid for the imported seed runs from $1 to as high as $10 per pound, the general price being about $3, the duty being 25c. per pound. From two and a half to four dollars per pound should secure good reliable stock tomato seed. The higher prices are as a rule paid only for the extensive use of printer's ink in vividly portraying their imaginary qualities. Beyond keeping the varieties pure by growing them in separate blocks after a certain

standard is reached, no special effort appears to be made by the seed firms, with a view to improving and perpetuating their desirable points by selection. A rough estimate places the amount of tomato seed used annually in Ontario at from eight to twelve hundred pounds, thus the market for seed here is very small, and accounts for the importation. J. Bolgiana & Son, of Baltimore, The Livingstone Seed Co., of Columbus, Ohio, The Burpee Company, the Wm. Henry Maule, Henry A. Dreer, and W. P. Stokes Companies, of Philadelphia, are some of the bigger firms from whom the seed is imported.

Control of the Supply: The majority of the factories retain the control of the seed, supplying the farmers at cost price. A few factories, however, leave the farmers to obtain their seed from whatever source they see fit, whilst still a few others grow their own plants and sell these to the contracting party. Some growers select their own seed.

Seed Selection: The advisability of the grower selecting his own seed is perhaps questionable. A. W. Livingstone and W. J. Green are

Earliannas on a Prince Edward Co. Farm on Southern slope.
Crop all harvested before end of August.

decidedly against this practice, their chief reason being, that while the grower may be able to select as good seed as the professional seed grower, yet the amount of seed which he uses is so small that the expense he would incur in producing it himself would be much greater than if he were to buy the very best selected seed from reputed seed firms. Notwithstanding this opinion, I believe that more of the seed used in this country should be grown here, and that a standard and well carried out system of straight seed selection among the farmers is highly desirable, and would materially increase the average yield and profit. The seed selection which is at present carried on to some extent is with very few exceptions far from what it should be. Some few growers will drive up to the canning factory and select for seed purposes individual tomatoes from the crates standing on the platform, without ever seeing the plants they were grown on. Others will select the smoothest, most uniform, and best ripened fruits in their fields without regard to the plants they grow on. Some go a step further and take the plant, its

vitality, amount and uniformity of yield into consideration. But not one grower have I met who has reserved a piece of ground exclusively for seed breeding and attempted to conduct rigid straight seed selection. The best seed selected one year is lost track of the next year. While considerable improvement in the yield, uniformity of size and smoothness of the fruits may confidently be looked forward to from proper selection, yet the greatest return which we may look for is a decided gain in early maturity, a very important factor in view of the shortness of the season. Some growers have already hastened the maturity of their crop some ten days in four or five years by a system of seed selection still open to improvement. Below will be found an outline of a system of seed selection aiming at improving the qualities spoken of, and which should be applicable to the case of the ordinary grower.

From the standpoints of soil, climate and market ascertain the type of plant and fruit best suited to your requirements, and keep the type clearly and constantly before you. Presuming that you have a field of tomatoes the seed of which is true to variety and reliable, go through that field and select one or more plants which in every respect approach nearest to the ideal in your mind. Mark these by staking them. Select healthy, productive vines of which the fruit is most uniformly of the desired type, for it must be remembered that the character of the seed is determined by the plant and not by the individual fruit. Thus the selection of an almost perfect tomato from a plant varying considerably in size and perfection is not advisable. The fruits selected should be large but not abnormally so, the earliest to mature, smooth and well shaped. When the fruit is thoroughly ripe, but not till then, it should be picked and the seed extracted as follows:—

Cut the tomatoes in two crosswise; slip out the seed-pulp into a pail or tub; let the pulp stand twenty-four hours, then put in plenty of clean water; stir and break up the sour pulp until all the good pulp seed will settle to the bottom when left to stand a minute; pour off the top, then put in more water, going through the same operation again and again until the seeds settle in nearly clean water. Now drain off all the water you can; place the seed in a towel, and press out the surplus water; they are then ready to spread out in the sun or some warm place to dry. Stir them up occasionally until they are thoroughly dried. In putting them away see that they are in a place safe from mice. Label the seed plainly, recording the day of the month and the year when it was saved, and moreover, keep the seed from each plant entirely separate.

Supposing that five plants were selected. The following spring the young plants raised from the seed thus saved should be set out on a well prepared piece of ground kept entirely separate from the main crop, taking care to keep the progeny of each plant separate and to set it in separate blocks. Label these blocks plainly, and as the plants grow compare them with the original plant from which they come and with the type in view. Select that block in which all the plants come nearest to the desired type, and which show the least variation. From that block the best plants are selected, discarding for further selection purposes all the other plants in the whole breeding patch. Such a course of selection should not be hard to carry out, and if judiciously and carefully done should in from three to five years result in strains of seed greatly superior and better adapted to one's own conditions than any which it is possible to purchase. The seed from the discarded plants may be used for the main crop, as it will be of a superior nature to that purchased.

Chalk's Jewel Tomato. Grown by W. C. McCalla.

Producing the Young Plants.

This is where one of the biggest causes of failure lies. When the plants are grown by professional growers they are often held back or suddenly forced to meet the grower's requirements, and through rush of business and lack of space are not properly hardened off. Where one grower is raising two hundred thousand or two hundred and fifty thousand plants, the space and appliances at his disposal are too often inadequate, and the attention which would be given to a smaller number is not applied, with the result that the plants are not as hardy or stocky as they should be. Many farmers are starting their own plants successfully, but in too many cases there is great room for improvement in the construction and make up of the hot beds and cold beds, and also in the management of the growing plants. I should like to be able to give more definite knowledge on this important phase of the business, but as the summer was already well advanced when the investigation commenced I was not afforded the chance to study the question. It is an essential of profitable production that good hardy, stocky plants be procured for setting. By the last week in May they should be from six to eight inches high, the stalk about the thickness of a lead pencil, and of a dark purple color and the root system well developed. It is essential that these plants be kept growing, that is, transferred to the field with the minimum amount of check, for any check that the tomato plant receives will always result in a reduction of the fruit, although the check may not be apparent in the foliage. Those spindly, light colored plants that are all stem, and seem, so to speak, up in the air, should be shunned. It is a sheer waste of time and money to endeavor to raise a crop from them. Below will be found a description of the hot beds and cold frames, together with other apparatus necessary for growing the plants required for a five acre patch. I have endeavored to describe those most suitable for the farmer growing from one to five acres of tomatoes for the canning factory. General directions are given for growing the young plants, and these of course must be modified to suit the conditions and requirements of the individual.

The Hotbed.

In locating hotbeds choose a warm sunny spot, dry and well drained, with as great a protection as possible from the north or northwest winds, a southerly slope being desirable. Let the land selected be some 30 yards long and 10 or 12 feet wide, and running east and west.

A hotbed frame of sufficient size to carry three 3 x 6 foot sash, that is, 9 x 6 feet, will enclose space enough in which to start the plants necessary for a five acre field of tomatoes. In the middle of the strip of land selected, remove the soil to a depth of one foot for a space of two feet larger each way than the size of the frames, that is, 11 x 8 feet. Now build up this space squarely with manure to a height of two feet. Fresh horse manure from grain fed horses without too much litter should be used. Uniformity of composition and in heating must be had if uniformity in growth is to be secured. This may be accomplished by shaking out and evenly spreading each forkful of manure and repeatedly and evenly tramping it down as the bed is being built up. The frame can now be placed on the bed of manure. It should be 10 inches high in front and 16 inches high at the back. If the back be made of two boards, let one of them be narrow and placed at the bottom so that the crack between them can be covered by banking up with manure or earth. Set the frame on the bed, first placing four short

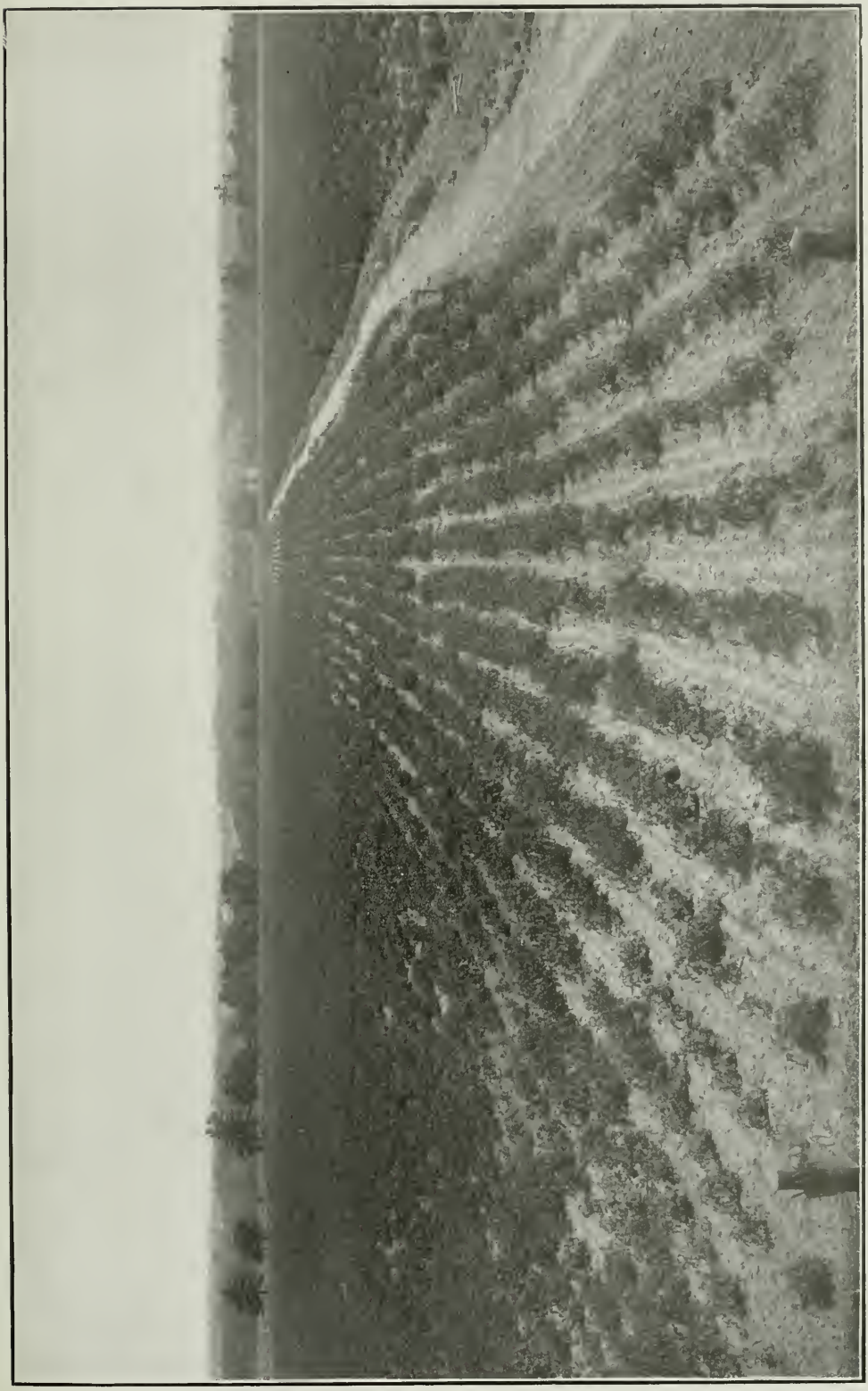
pieces of board under the corners to ensure even setting in the manure. Now complete the hotbed by placing on a top layer six inches deep of light, rich friable soil. A soil composed of about three parts of garden loam, two parts well rotted stable manure, and part of an equal mixture of sand and leaf mould, is desirable.

The Cold Frames.

The young plants started in the hotbeds are to be pricked out into these. They may be of the same dimensions as the hotbed frames, and for convenience should be placed on either side of the hotbed, and adjoining it for a distance of 36 feet, giving space enough to hold, pricked out to four inches apart, all the plants which can be started in the central hotbed. The soil underneath the cold frames for a depth of eight inches should be removed and a five inch layer of well rotted stable manure placed in. This manure should be dry enough so that it will not become pasty when tramped into a firm level layer, and sufficiently rotted that it will not heat. On this place a four inch layer of the soil described above. Although cloth curtains often replace sash as a covering for these cold frames in more southerly climates, yet for this Province the sash had better be used.

Directions for Growing the Plants.

We now have a hotbed located centrally in the middle of the cold frames and containg some 54 square feet, upon which we are to start plants enough to set five acres. First, thoroughly level off the soil upon which the seed is to be sown. About the first week in April sow the seed in drills ½ inch deep and 3 inches apart; seven or eight seeds to the inch. Now scatter over the surface an equal mixture of leaf-mould and lake sand and press firmly and evenly over the seeds. This covering will not bake or crust, and the tender shoots of the germinating seeds can much more readily break through. If the soil is dry sprinkle lightly with tepid water and replace sash, partially shading the same. We now have some 36 rows 70 inches long and sown eight seeds to the inch, or a total sowing of over 20,000 seeds, which should give us enough plants for our purpose. It will take from three to six days for the plants to break soil, and the temperature during this period should be from 75 to 85°F. in the day time, and from 55 to 65°F. at night. When the plants have practically all broken through remove the covering from the sash and reduce the temperature to from 70° to 80°F. The temperature can be regulated by dropping open the sash. After about ten days reduce the temperature to from 65° to 70° F. and give more air. Dull cloudy weather, too high a temperature, crowding of the plants and insufficient ventilation, causes damping off. Great care must be taken not to over supply the young plants with water, as this will also cause damping off. Endeavor to keep them growing thriftily, with as little watering as possible. Some authorities favor two transplantings, and others only one. The system here recommended is a combination of the two. As soon as the central bud is well started prick out the plants to the cold frames, setting two inches apart. Remove the plants as carefully as possible, preserving the root system intact, and set them a little deeper than they were in the hotbed, pressing the soil tightly around them, so that they cannot be easily pulled out. To prevent excessive wilting, shade the young plants for the next few days. Don't apply any more water than necessary, and be sure that it is tepid. As soon as the plants are well established in their new positions admit as much



Sixty Acres of Tomatoes.

light as possible, being careful that the temperature does not fall below 45°F., and that the plants are not subjected to cold winds. As soon as the plants begin to crowd one another transplant every other plant, setting them four inches apart; this will leave the whole lot four inches apart, half of them transplanted twice and the other half only once. When set in the field those transplanted twice will probably bear the first ripened fruits, and those transplanted once will follow shortly. Be careful not to over-water the plants or expose them to unfavorable winds, and maintain a uniform temperature throughout the day of from 60° to 75°F. Observe these precautions, and by the time that it is safe to set in the open field you should have good, hardy, stocky plants, which, with subsequent favorable attention and conditions, will produce a heavy crop.

A very convenient article to have when transplanting is a spotting board. This may be about 5 feet 10 inches long, one foot wide, with round tapering fingers, about one inch in diameter at the base, and 2½ inches long. These should be fastened into the board the distance apart the plants are to be set, in this case 4 inches. It should also have narrow projections carrying a single peg nailed to the top of the board at each end, so that when these pegs are placed in the end holes of the last row, the first row of pegs in the spotting board will be the right distance from the last row of holes or plants. By standing on the spotting board while setting plants in one set of holes, holes for another set are formed. The cost of the frames and sash recommended need not exceed $75, and might be considerably less, and they may be turned to advantage in many ways when not occupied by the young tomato plants.

The Use of Barnyard Manure and Commercial Fertilizers.

The nature and amount of fertilizing elements to be applied to the soil is dependent upon such a number of local conditions that no one individual can recommend a certain practice and guarantee success to all those who follow it. The more growers one sees the greater the variety of practices and the differences of opinions that one meets with. In general, the application of barnyard manure is not heavy, from 8 to 10 tons of well rotted stuff to the acre. In southern Ontario, to a lesser extent in western Ontario, and to a still less extent in eastern Ontario and Prince Edward County, this is supplemented with from 200 to 500 lbs. of commercial fertilizer, 2-8-10 generally, worked in around the plants at the time of setting. A relatively large percent. of of potash and small percent. of nitrogen is desirable, since a large proportion of nitrogen will cause the plants to run to vine and lessen the yield, while potash tends to produce smaller vines and a better all round quality of fruit. The grower must strive to ascertain what his soil needs and aim to supply that need. The results with fertilizers have been so variable that I cannot make any general recommendation as to their use. Many growers in southern Ontario, however, would not think of doing without them, and they are more or less used in the other districts, yet many growers have no use for them. The grower must determine the actual value of these fertilizers to his soil by experiment. It can never be done by theory. Suffice it to say, that many growers would get heavier crops if they prepared their ground better, paid more attention to cultivation and used less fertilizer.

Fungous Diseases.

In this respect the tomato crop is very well favored, for compared to the potato and other crops, the yield is very little affected by the ravages of insect pests or fungous diseases. Of all the poor yields and backward fields of tomatoes seen, not one was due in the main to either of these two causes. Leaf Spot (*Septoria lycopersica*), commonly called blight, produces small roundish dark brown spots on the leaves and stems, and occasionally on the fruits. The lower portion of the plant is attacked first. Leaf spot was met with occasionally, but always very light, and never spread to any extent until the plants were well advanced and well loaded with fruit. Sometimes towards the end of the season it spreads rather rapidly, but as the plant by that time has set all the fruits the remaining length of the season will ripen, the effect is hardly detrimental, often helpful, by decreasing the foliage, thus exposing the fruit to sun and ripening it up more quickly.

Blight (Bacillus Solanacearum), a bacterial disease, turning the stems and leaves brown and black. Less prevalent than the leaf spot. Both these diseases are referred to by the bulk of the growers as blight, no distinction being drawn between the two.

Remedies. As already stated these diseases have not been prevalent enough in the province to cause any alarm. Thorough cultivation inducing vigorous, healthy growing plants with frequent changes of the land will probably eliminate trouble from this source. Spraying with Bordeaux mixture is recommended by plant pathologists, but is generally considered impracticable owing to the labour necessary to do the work well. If resorted to it should be conducted as follows:—

1st. Spraying while the young plants are still in the seed bed a few days before transplanting.

2nd. Spraying, a week after the plants are set in the field.

3rd. and 4th. Spraying at intervals of two weeks. If needed a fifth spraying two weeks later. The work should be done thoroughly, every leaf being covered with a fine mist. Spray while the plants are still healthy.

Point Rot or Black Rot of Tomato. It occurs on the green fruit at various stages of its development. The germs causing the disease often lodge at the blossom end of the fruit when it is very small. It begins as a sunken brown spot and gradually enlarges until the fruit is rendered worthless. The decayed spots are often roundish and covered with a dense black velvety growth, macrosporium tomato, which was formerly thought to be the cause of the rot, which has since been proved to be only a saphrophyte. This disease is met with in small quantities over the Province, is not serious but is often confounded with anthracnose or the ripe rot of tomatoes. Dry weather and light soils with insufficient moisture supply favor the prevalence of Black Rot. Spraying will not control it. Thorough cultivation and change of land will help. Gather up all the diseased fruit and burn it.

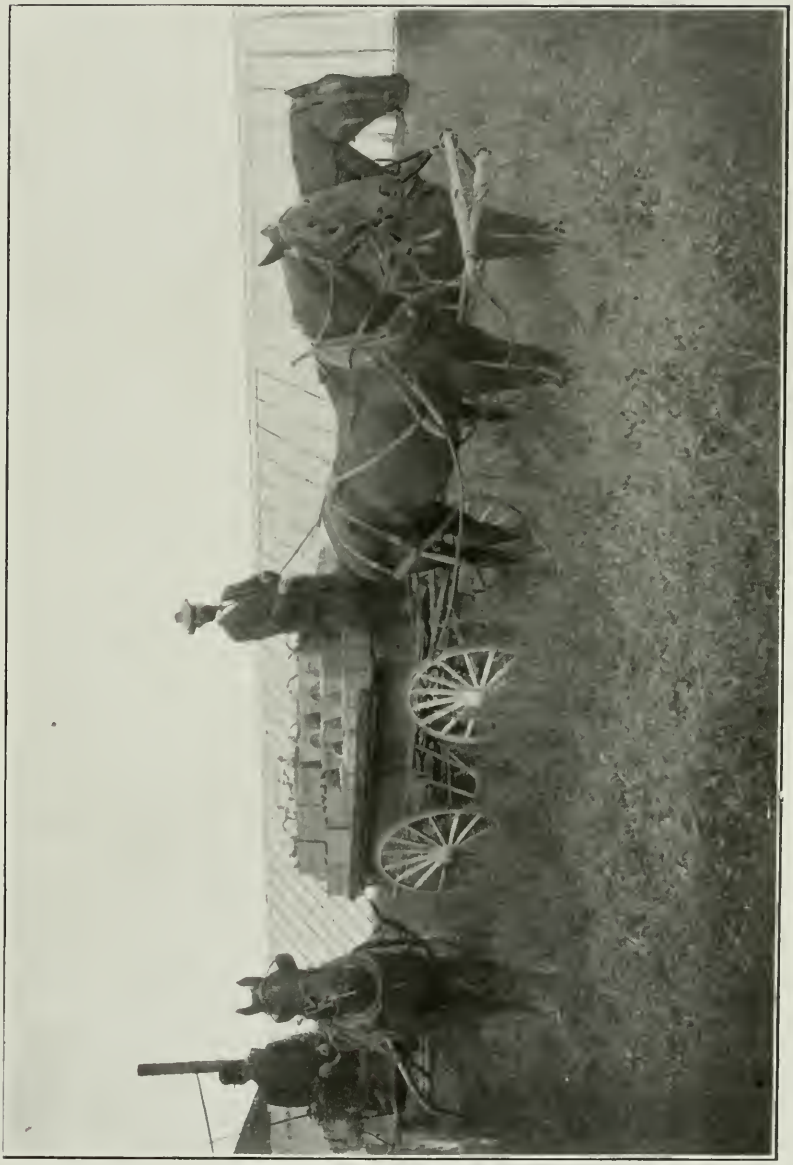
Anthracnose—Ripe Rot (*Colletotrichum phomoides*). This disease is distinguished from black rot by the fact that it occurs on ripe or nearly ripe fruits, and produces a soft rapid decay. It is greatly favored by damp, rainy weather. It is commonly met with, in a few cases causing considerable loss. It is more prevalent in varieties that grow a heavy close vine and will be found among the crown fruits and those resting on the ground, the exclusion of light and air tending to conditions favoring its growth. The remedies suggested for black rot should be used in this case. When gathering the first pickings instead of leaving these anthracnose infested fruits where they lie they should be placed in a separate basket and destroyed. Avoid as far as possible varieties that grow excessively heavy and dense vines.

Cutworms. A considerable amount of trouble and loss has been caused to tomato growers in the province, more particularly in the eastern Ontario and Prince Edward County districts, by the ravages of various species of cutworms. In the two districts just mentioned often 25, 50 and even 75 per cent. of the plants have had to be reset, so great have been the depredations of the pest. No description of these insects and their methods of attack is necessary as growers are as a rule quite familiar with both of them. Strange to say with a few exceptions, the growers have made no effort to fight this pest, beyond continual resetting which involves considerable additional labor and expense, and the reset plants are always behind. Those who have given a fair trial to the poisoned bait remedy have done so with much success. In the whole list of remedies for insect pests the poisoned bran mash has been one of the most effective, and it is to be regretted that such a cheap, easily applied and successful treatment as it has proved to be is not more generally used. In order to get the best results from the use of this bait the following precautions in preparing and applying it should be observed.

Procure a bushel box or large soap box and place 25 lbs. of bran in it. Moisten with half a pail of water thoroughly diffusing the moisture throughout the bran. It is better to have the bran under moistened rather than over moistened. Dissolve 3 lbs. of sugar in half a pail of water and add this in the same way. The right amount of water has been added when the bran is moist enough to cause the fine particles of Paris green to adhere to it and when it crumbles easily and runs through the fingers without adhering. Now take $\frac{1}{2}$ lb. of Paris green and dust a portion of it over the surface of the bran. Stir the bran up thoroughly. Repeat this process until the whole $\frac{1}{2}$ lb. of Paris green is thoroughly disseminated through the 25 lbs. of bran. If the Paris green is added to perfectly dry bran, owing to its weight it will sink at once to the bottom when stirred, in the same way that it does in water. Until ready to use place the mixture in a cool shaded spot. The land upon which the crop is to be grown should be kept free from all vegetation for two or three weeks previous to planting. This renders the cutworms hungry, and they will eagerly attack the poisoned bait when it is applied. The bait should not be applied till after the sun has gone down. If applied in the day time the heat of the sun dries out the mixture, and it loses some of its sweetness and is less attractive. The first application should be made in the evening of the day the plants are set out and subsequent applications during the next few days at the grower's judgment. When applying, sprinkle just a little close to the stock of each plant. Fifty lbs. of bran with one pound of Paris green thoroughly sweetened and prepared as above described will cover one acre and can be applied in two hours, so that this remedy is much cheaper and more satisfactory than resetting. Wherever a plant is cut off, the worm is sure to be quite near the root and should be dug out and destroyed. Clean farming will also help by destroying many eggs and preventing the deposition of others.

Flea Beetles and Colorado Potato Beetle. A number of complaints were received of these insects, more particularly the Colorado Potato Beetle, feeding on the foliage of the young plants soon after they were set out. Spraying with Paris green 1 lb. to 100 gallons of water, or with 1 lb. of Paris green to 100 gallons of Bordeaux mixture whilst still in the cold frames and another spraying three or four days after planting is effective.

The Tomato Worm. A large green colored worm about three inches long feeding on the foliage seldom met in quantities large enough to do serious damage. On account of their color being almost identical with that of the plant, they are somewhat hard to see, but a little experience will readily help one to detect their presence, and they can be held in check by hand picking.



The President starting for market.

Varieties.

There are a great number of varieties of tomatoes grown throughout the province and I make no attempt to recommend particular ones for each district. There are, however, certain varieties commonly grown in each district which have given general satisfaction both to the canner and grower, and one is fairly safe in choosing any one of these. Ignotum Matchless, Worden, Greater Baltimore, Perfection, Success, and for a fairly early tomato Chalk's Jewel and selected strains of Earlianna. Stone, although a good yielder and an admirable variety from the canner's standpoint, is apt to be a little late and often a portion of the crop is caught by frost. Selection with a view to early maturity would produce a very valuable strain of this variety. Chalk's Jewel is apt to run off in size, and Earlianna after the first picking falls off in quality of yield, the fruits not ripening up well at the stem end thus causing a waste to the canners. Both these varieties may be rendered still more valuable by judicious seed selection.

Tomato Catsup.

I failed to obtain any reliable estimate of the amount of whole tomatoes and tomato pulp manufactured into catsup; comparatively few factories put up pulp for this purpose. There is much concerning the produce from which this catsup is made, and the way that it is handled that is open to criticism and improvement. In some canning factories the tomato slop and peelings lies for some time in open receptacles, and in some cases sours and almost decomposes before being boiled down into pulp and finally converted into catsup. In too many cases the same cleanliness is not observed in handling the material that is converted into pulp as is observed in packing the tomatoes. The bulk of the canning factory tomatoes are of the solid meaty varieties and do not contain over-much juice and acid. On the other hand the finest tomatoes for catsup are those containing the greatest amount of acid and juice and less meat, which three qualities go together. Such tomatoes are not often produced in canning factory districts, and the rough product from which the catsup is made consists of refuse from all sorts and conglomerations of tomatoes, and hence the poor quality of the final product. The Earlianna is a variety of superior flavor and valuable for good catsup making.

Probable Extension of the Business.

There were packed this year in the Province of Ontario in the neighborhood of 21,000,000 cans of tomatoes, or about 3½ cans to each head of the population in the Dominion. This fact would seem to indicate room for extension of the business, but this extension largely depends on the quality of the goods put before the consumer. There never has been a time when strictly first class canned tomatoes were packed in excess of the demand. There may have been a time when the market was overloaded and injured by second class goods. The condemnation or approval of the masses who purchase these goods directly affects the supply and demand. If the consumers had implicit confidence in all canned goods, and those canned goods were strictly first-class, then the demand would be much greater than it is at present, and the possibilities of the canning industry would increase very materially. However, in this respect it would be well to remember that the canning factories in Ontario are by no means run to their full capacity, and

that if they were, without increasing their number they would be able to supply a much greater demand than they do at present.

Tomato Refuse.

As already stated many factories do not put up pulp at all, and those that do still have a certain amount of refuse on their hands, so that all the factories have tomato refuse to dispose of. In a number of cases it is drawn away by growers to be used for pig feed. If not fed in too concentrated a state it proves of value. Used in large quantities and without mixing any other foodstuff with it, it is decidedly dangerous on account of its acidity. In other cases it is drawn away and spread on the land for its fertilizing value, on which there is considerable difference of opinion, some claiming to have used it with a fair amount of success while others do not consider it worth the time it takes to draw it to the field. The majority of it is disposed of in these two ways. However, in a few cases it is drawn away to some dump nearby—a most objectionable practice. Where factories are situated on the banks of a creek or river, the refuse is dumped straight into the stream and is carried away by the current, and many bitter complaints of such a practice have been made by nearby farmers who depend upon the water thus contaminated as a drinking supply for their cattle. There is room for investigation and experimental work as to the feeding and fertilizing value of this and other canning factory refuse, and certainly room for improvement in the legislation controling its disposal or in the enforcement of that legislation.

Other Species.

Cherry, pear and plum tomatoes are grown to a very limited extent to be used in making preserves and sauces. They will be found on the markets from August 1st to October 15th, at prices from 60 to 75 cents per 11 quart basket.

List by Districts of Factories Packing Tomatoes.

Prince Edward County.

Independent.

Bloomfield Packing Co., Bloomfield.
Farmers' Canning Co., Bloomfield.
Hillier Packing Co., Hillier.
Lakeside Canning Co., Wellington.
Old Homestead Canning Co., Picton.
Port Milford Packing Co., South Bay.
Potter's Canning Co., Demorestville.
South Bay Canning Co., South Bay.

Consolidated.

Wellington Packing Co., Wellington.
Boulter & Sons, W., Picton.
Miller & Co., A.C., Picton.
Saylor Co., A.B., Bloomfield.

Eastern Ontario.

Independent.

Belleville Canning Co., Belleville.
Frankford Canning Co., Frankford.
Napanee Canning Co., Napanee.
Oshawa Canning Co., Oshawa.

Consolidated.

Brighton Canning Co., Brighton.
Lakeport Preserving Co., Lakeport.
Port Hope Canning Co., Port Hope.
Miller & Co., Trenton.

List by Districts of Factories Packing Tomatoes.—Continued.

Southern Ontario.

Independent.

Beamsville Preserving Co., Beamsville.
Black's Canning Co., St. David's.
Burlington Canning Co., Burlington.
Flynn Bros., St. Catharines.
C. Fretz, Vineland.
Jordan Station Canning Co., Jordan Station.
Niagara Falls Canning Co., Niagara Falls.
Usher Isaac & Co., St. David's.
Wethey Co., T.H., St. Catharines.

Consolidated.

Aylmer Canning Co., Hamilton.
Bowlby Bros. Waterford.
Delhi Canning Co., Niagara.
Laylor Canning Co., F.R., Dunnville.
Grimsby Canning Co., Grimsby.
Lowery Bros., St. David's.
Simcoe Canning Co., Hamilton.
Simcoe Canning Co., St. Catharines.
L. M. Schenck Co., St. Catharines.

Western Ontario.

Independent.

Alvinston Canning Co., Alvinston.
Essex Canning Co., Essex.
London Canning Co., London.
Tecumseh Canning Co., Tecumseh.
St. Thomas Canning Co., St. Thomas.
Tillbury Canning Co., Tillbury.
Thames Canning Co., Thamesville.
Wallaceburg Canning Co., Wallaceburg.

Consolidated.

Amherstburg Canning Co., Amherstburg.
Belle River Canning Co., Belle River.
Imperial Canning Co., Kingsville.
Kent Canning Co., Sandwich.
Leamington Canning Co., Leamington.
Strathroy Canning Co., Dresden.
West Lorne Canning Co., West Lorne.

EARLY TOMATOES.

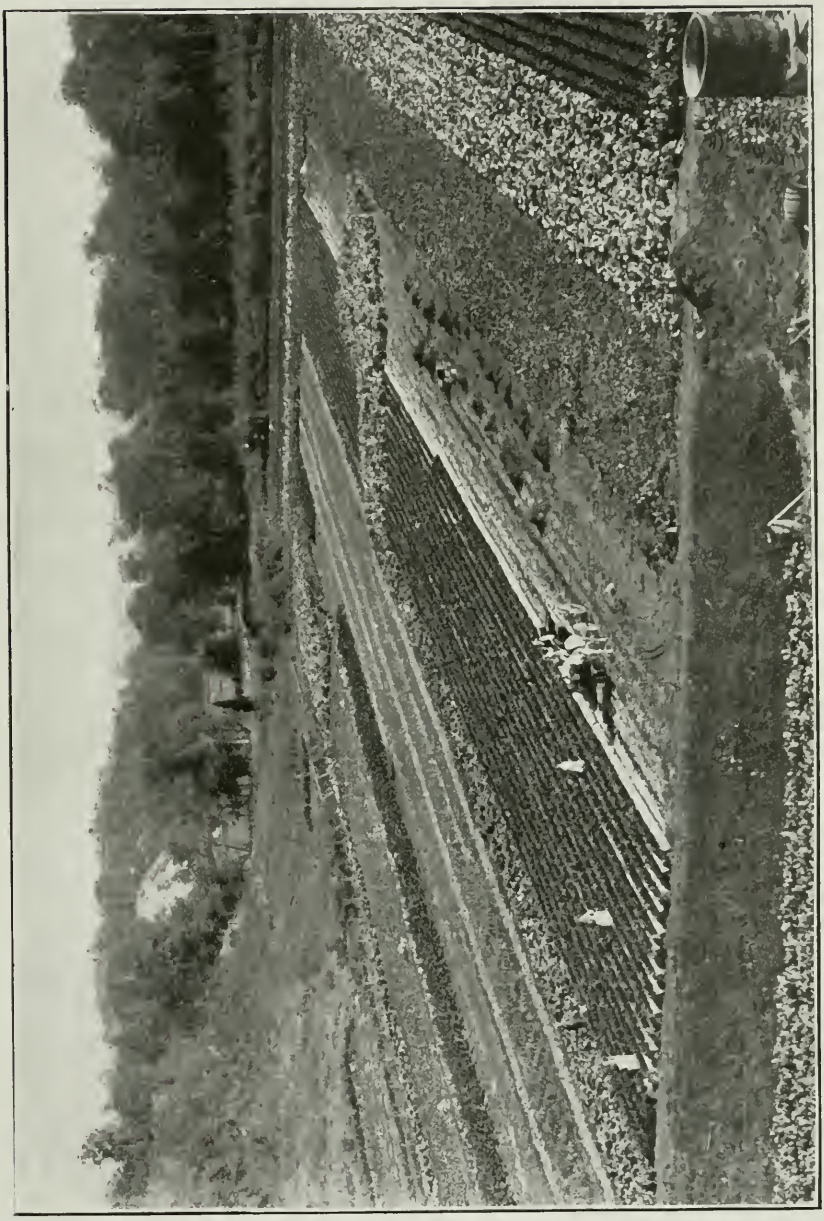
Extent of the Industry in Ontario.

The production of early tomatoes to supply the demand before the first of the main crop matures has assumed considerable proportions in the more favoured districts, namely, the Niagara peninsula, the Leamington district in Essex Country, and the neighbourhood of Toronto, and is carried on to a lesser extent throughout the tomato growing sections of the Province.

The summer was already well advanced when the investigation commenced, and this fact coupled with the great extent of the area to be covered, and the large number of canning factory districts to be visited, rendered it almost impossible to pay any attention to this portion of the industry. In this respect another deterring element was that the investigation commenced in the eastern portion of the Province and the really early sections were not reached until the close of August, when the early crop was well over and the main crop coming in.

In the United States it is claimed that the amount of tomatoes annually put on the market in the fresh state is equal to the amount put up in cans. There is, however, no definite reliable information on this point, but certainly the amount sold in the fresh state in Ontario and the north-west is far below the amount taken by the canning factories. In the States the tomato is produced out of doors almost the whole year round, and doubtless the production of the great truck growing regions of the South considerably helps to swell the amount marketed in the raw state, in that country.

While in this country a large number of tomatoes are consumed in the fresh state, all the time the main crop is maturing, yet these cannot be classed as early tomatoes, the season for which may be said to extend only from July 1st, to August 15th.



Intensive Truck Farming.

In the Leamington district, including Kingsville, Ruthven, Essex Centre, and Windsor, the total shipment during the above mentioned period exclusive of those consigned to Winnipeg would approximate to $40,000 eleven-quart baskets. Of the extent of the shipments in the Niagara and other districts, I have no information at all reliable. The task of collecting information on this point is complicated, and necessitates the thorough co-operation of the express companies and wholesale fruit and vegetable produce handlers. An examination of the express companies' shipping bills at the individual stations is not altogether satisfactory, as the consignments are often mixed and merely recorded on the bill as so many baskets of fruit, the actual amount of each product not being specified. Also between July 1st, and August 15th, a considerable quantity of tomatoes are placed directly in the hands of the retailers throughout the Province by the growers themselves.

Markets

The majority of these early tomatoes are marketed throughout Ontario, the bulk going to the principal cities and towns. The amount shipped to Winnipeg is not known, the consignments being mixed. The Essex growers claim that the Western trade has not proved satisfactory as the first shipments by express are expensive and compete with the American grown product. Later on in the season when they are shipped in bulk much cheaper by freight, for some 60 cents per 100 pounds, they come into competition with the St. Catherines tomatoes, and the prices do not hold up well. Also they are not handled in Winnipeg to the best advantage of the grower, the jobbers taking too large a share of the profits. It seems that in this respect there is room for improvement in the selling organization for the western markets.

Culture.

The culture of early tomatoes is in the main, the same as for the canning crop, the greatest difference being in the growing of the young plants. The seed is sown from February 20th to March 1st. The number of transplantings is more than in the case of the main crop, often as many as four, the last two transplantings into cold frames, the final transplanting being to six and even seven inches apart. At the time the plants are set in the field they will be some fifteen inches tall, with a spread of an equal distance, and bearing small tomatoes. The time for setting out varies with the districts, from the 4th to the 10th of May in the Essex district, somewhat later in the Niagara peninsula and points further east. The plants are generally set 5 x 4 feet in the field. The first picking will be about July 1st and the bulk of the crop will be matured by the middle of August.

Cost of Production.

The great difference between the cost of producing the main crop tomatoes and early tomatoes lies in the increased expenditure incurred in the growing of the young plants and in the marketing of the final product. None of the early tomato growers with whom I came into contact had kept any record of the cost of production, chiefly because the young plants are grown in green houses along with other produce and the task of apportioning the various items of expenditure to each crop was a difficult one. They were,

however, unanimous in placing the cost at from thirty-five to forty-five dollars per 1,000. The land suitable to the production of these early tomatoes in these more favoured sections of the Province is considerably higher priced than that used for producing the main crop, and the rent item is therefore increased from seven to ten dollars per acre. The tomatoes being marketed in eleven-quart baskets also renders the cost of production higher. Taking these facts into consideration the total cost of production per acre will probably range from $175 to $200. The expense of picking, cleaning and packing the tomatoes into eleven-quart baskets is as mentioned heavy and therefore a light or heavy crop would make a considerable difference to the total cost of production.

Prices.

The prices for the first picked fruit will run from $1.50 to as high as $2.00 and $2.25, dropping to $1.00 per basket by the middle of July. By the end of that month they will be down to 70 cents and by the middle of August, will be selling as low as 30 cents per basket.

Varieties.

The Earlianna and Chalk's Jewel were the only two varieties I met with being used for this trade. Of these the Earlianna is earliest and more generally used.

T. Delworth: I would like to know what a man pays for his labour, if he gets the work done for $60 an acre?

A. G. Turney: That is a question upon which there is a great deal of dispute, because a lot of men do not want to count in their own labour. If they estimate the labour of a man and team, they do not figure it out at the price they would have to pay if hired.

T. Delworth: That is where a great many vegetable growers fail in not estimating the proper price of their own and hired labour. If you should use twenty tons of manure an acre; they will cost you at the car $20, and it has to be hauled from the car and spread on the field ready for plowing under. If the field is three miles from a station, how many tons will an ordinary man with a team of horses spread on the field? It is worth an additional dollar to haul it.

A. W. Peart: It is worth $4 for six tons.

T. Delworth: That is seventy cents a ton to deliver or $34. an acre for the manure to start with.

A Member: You should not charge that whole cost to a single crop.

A Member: The market gardener would not be satisfied unless he applied that each year.

A. G. Turney: Take twenty tons to the acre; the gardener who takes that from his barnyard would not estimate it at more than 50 cents a load.

E. E. Adams: Does Mr. Delworth put on twenty-five two horse loads per acre, every year.

T. Delworth: I do not make a practice of planting tomatoes year after year on the same land.

E. E. Adams: I am told by a gentleman that he has raised eighteen crops from the same soil year after year and the last crop was the best.

Mr. McCalla: I might make this statement, with regard to the cost of producing, that it depends upon one's local conditions and upon the way in which things are estimated. I want to say that I heartily approve of

what Mr. Delworth said with regard to the estimated cost to the farmer of teams and labor. We have to feed our teams in winter and on rainy days and on Sunday, and unless we can get a pretty good price for our teams when actually working, we shall go behind, and we could not afford to keep teams for very much less than the man in town. We must not expect to work ourselves for less than the hired man gets, so that we ought to charge up the full cost of labor in every case. We figure it out in St. Catharines that a 400 bushel crop of tomatoes would cost to grow and deliver between $70 and $75 per acre.

As far as the manure is concerned. I would not if I could, put 25 tons of manure on any soil in ordinary good condition, and then plant tomatoes in it, as I would get too much top. Fertilizers have received such hard treatment here that I want to give you a statement of actual facts. I had a piece of land that was in peaches for five years. It received some commercial fertilizer and wood ashes and no stable manure. Two crops of clover were plowed under. We pulled out the trees and put on twelve spreader loads of fresh manure to the acre, that would be twelve tons. I planted it to corn and followed the corn with potatoes, using no manure but applying 600 pounds to the acre of high grade home mixed fertilizer. After the potatoes I had a good crop of wheat; sowed clover with the wheat and when the clover was seven or eight inches high, I turned it under and planted peaches again, and between the peach trees I planted tomatoes. That land had no manure since 1905, and I grew this year, if we count the actual land occupied by the tomatoes and not allow anything for head lands and drive ways, on four acres, 695 bushels to the acre, and if we allow for head lands and driveways, I had 600 bushels. It is all right to say twenty tons to the acre on certain land, but I think commercial fertilizers are a good deal better and safer. Manure costs us about $2 a ton put on the field.

A. Member: What do the farmers in your neighborhood value their land at,

W. J. McCalla: $150 an acre.

T. Delworth: Our land is so valuable that we cannot plow under clover. A great deal of the land used around here for market gardening is worth double what Mr. McCalla estimates his land at.

W. J. McCalla: What will suit one locality will not do in another. The land on which I am growing tomatoes is worth from $200 to $250 an acre, and I would not have manure put on, if you drew it and put in on free. We plant tomatoes where we have grown musk-melons the previous season, and we have put on seven or eight tons to the acre for musk-melons.

T. Delworth: My crop for last year was slightly over $\frac{3}{4}$ of an acre, and we harvested over 600 bushels, and one-half of them was the Earlianna.

A. G. Turney: If we take Mr. McCalla's estimate of the cost as $75, that would leave only a profit of $15 if you only produced 300 bushels, but most men produce at least 400. Would you consider a profit of $50 an acre a men produce at least 400. Would you consider a profit of $50 an acre a fair return where it is almost a farm crop?

T. Delworth: A very small return to a market gardener who has to make a living off of five acres of land.

F. G. Fuller, London: Some people have said that they can get land too rich for tomatoes. I admit that may be so for a late crop, but for an early crop I think it is absurd. If you don't have your plants well grown when you put them out then your ground can be too rich, but if your plants are early and you have some fruit on them when you set them in the ground you cannot have it too rich even if it is one-half manure. Last year we put

some out and forced these plants to the first of June, 3,000 plants to the acre, and from one acre we received between $500 and $600. The Dwarf Champion is not a large cropper, but we cannot get our land too rich for it.

A Member: In my opinion we are running on two lines. I look upon the question of growing tomatoes for the factory a separate question altogether from growing them for the market.

James Guthrie: Don't you think it is necessary for the market gardener to know what he is getting? I am one of the oldest gardeners in the room, and I have had a good deal of experience. I grow for the Toronto trade. I pay my taxes to the City of Toronto and they amount to about $300 an acre, and I have made a good living on 10 acres and raised a family of eleven. How could I make a living growing tomatoes, if I only realized $50 or $60 an acre of profit? It cannot be done. I grow an immense crop. I have greenhouses and grow flowers and vegetables, and a man has to work carefully in the City of Toronto to make a good living even if he did not have to pay taxes. Some men have advocated manuring very highly for tomatoes. I have grown them for thirty-six years. I do not put on one ounce of manure for them, but I manure highly the previous year for another crop. Where I grow potatoes this year, I plant my tomatoes next year, and I have sold them on the market for 25 cents a quart. If I manure my tomatoes the same as some have suggested, I would have them all tops. I do not manure the Dwarf Champion, because it does not grow too quick. You can plant Dwarf Champions a foot apart every way and walk between them.

INSECT PESTS AND FUNGOUS FOES OF GROWING VEGETABLE CROPS.

By T. D. Jarvis, O.A.C., Guelph.

There are no new insects or fungous diseases of importance to be reported upon for 1908; but every year certain well known pests occur in increased numbers and require special attention.

The annual losses due to insect and fungous attacks on vegetable crops is estimated at 33 per cent. It is important, therefore, that the progressive vegetable grower be well equipped with a knowledge of insects and fungous diseases. "Insects Injurious to Vegetables," by F. H. Chittenden, U. S. Department of Agriculture; "Insect Life," by J. H. Comstock, Cornell University, and "Plant Diseases," by Geo. Massee, are recommended for the vegetable grower.

The more general observance of certain farming methods, such as involve no extra outlay for machinery or insecticides, but require modification of ordinary farm practices, will greatly lessen the losses from this source. They are the most advisable methods of dealing with crops of low value, such as turnips, cabbage, and other vegetables which would not justify greater expense.

Clean culture includes the destruction of weeds, especially those of same natural family with crop, *e.g.*, Lamb's Quarters, Spinach and Beets.

Destruction of Rubbish. Many insects hibernate under trash, boards, chips, etc. Cutworms, Armyworms, Squash-bugs, and other pests pass the winter in such places. Fence corners harbor many like insects and also Grasshoppers in young stages. The cleaning out of such places, burning trash, etc., during the winter will aid. Even the whitewashing of board

fences is an aid in sealing up the corners and cracks where flea-beetles, etc., hide.

Destruction of Remnants. Remnants should be destroyed, preferably by burning, as soon as the crop is gathered. Many insects multiply or pass the winter on or in the remnants of crops, as Worms and Aphids on Cabbage and Cauliflower remnants; Cutworms and Flea-beetles on Tobacco, Stalk Weevils on potato vines, and Squash-borers in squash vines, etc. All these may be checked by promptly burning or putting in compost heaps all such remnants as soon as crop is gathered. Rotations are good for the land and for crops, and deter insects. Crops of same nature should not follow each other when attacked by insects or fungous diseases, *e,g.*, when crops like potatoes, tomatoes, and tobacco follow one another flea-beetles, tomato-worms, potato beetles, and various blight diseases thrive, but if the land is rotated with corn, onions, etc., alternating with other crops, much injury will be averted.

Plowing at certain times often checks insects, especially underground species, by exposing to cold weather, etc., or by starving through destruction of natural food. Wireworms, Cutworms, and White Grubs may be checked in this way. Fall plowing is usually best for this purposes.

Fertilizers stimulate the plant to resist insect and fungous attack.

Vegetable growers should be provided with a complete outfit for spraying operations and should keep on hand or know where to obtain within short distance a good supply of necessary insecticides.

Arsenate of lead is coming into use in place of Paris green. It may be had in paste or powder form and used in water or Bordeaux at from two to four pounds to 50 gallons. It adheres to leaves well and is not likely to burn. The mixture is said to remain in suspension 15 times as long as Paris green. It may be purchased from the St. Catharines Co-operative Association, from the Spramotor Co., London, or the chemicals may be obtained from druggists and the preparation made at home. The Chemical Department at the O.A.C. recommends for home use:—

Arsenate of soda 10 ounces.
Acetate of lead 24 ounces.
Water 150 to 200 gallons.

The arsenate of soda and the acetate of lead (sugar of lead) should be dissolved separately and then poured into a tank containing the required amount of water. A white precipitate of lead arsenate is immediately formed, and when thoroughly stirred is ready for spraying.

In a recent bulletin published by the Experiment Station, Cornell University, a formula is given for an adhesive fungicide which is not washed off by rains:

Resin 2 lbs.
Sal. soda crystals 1 lb.
Water 1 gallon.

Boil the mixture until you get a clean, brown color, which usually takes about an hour and a half. For onions, asparagus, cabbage and salsify add 40 gallons of Bordeaux to mixture and for other plants 80 gallons of Bordeaux to mixture.

Insects with sucking mouth parts, such as aphids and leaf hoppers, are killed by contact poisons and one of the simplest and most effective remedies consists of a mixture of soap and water. Shave soap in thin pieces in water and boil till dissolved.

Garden insects may be classified as follows:—

1. Plant-lice (Aphids, Leaf-hoppers, plant-bugs and related insects. 2. Cutworms and related insects. 3. Miscellaneous caterpillars. 4. Leaf-beetles. 5. Flea-beetles. 6. White Grubs. 7. Wireworms. 8. Grasshoppers and related insects. 9. Mites. 10. Slugs.

Plant-lice (*Aphides*), Leaf-hoppers, Plant bugs, Thrips and related insects all obtain their food by suction. Plant-lice and Leaf-hoppers were excessively abundant this year, the dry season having been favorable for their multiplication.

The best remedies are soap-suds, kerosene emulsion and tobacco extracts; clean culture is also recommended.

Cutworms and related insects. There are many species of Cutworms, and it is impossible to give a description to fit all, but the most injurious species are soft bodied, smooth, cylindrical caterpillars, varying in color from gray to nearly black, many of them being plainly striped or spotted. Cutworms feed only at night, remain in concealment during the day, hiding in the ground or under any rubbish they can find. Poisoned baits are the best remedies against Cutworms. Bran mash treated with any arsenical, such as Paris green or arsenic, 2 or 3 ounces to a gallon of water and about 1 pound of bran per gallon.

Miscellaneous Caterpillars. Naked and hairy caterpillars which are in the main diurnal. The zebra and the corn-ear-worm are smooth and the yellow-bear and the soft marsh are representative of the hairy type.

A spray of Paris green or lead arsenate will give good satisfaction for these pests.

Leaf-beetles, such as the Asparagus beetles, Cucumber beetles, Potato beetles and Blister beetles. Paris green, lead arsenate and clean culture are recommended. Flea-beetles are mostly small insects of a dark color. They have strongly developed hind thighs, which enable them to leap well. The Turnip Flea-beetle and the Melon Flea-beetle are familiar examples.

Arsenicals, Bordeaux mixture and clean culture are recommended for the control of these insects.

White Grubs. The parents of White Grubs are known as May beetles or June beetles. The adults attack the foliage of many trees. Fall plowing is the best means of keeping these insects under control. This exposes the grubs to the cold and to weather agencies. Rotation of crops and clean culture are also recommended.

Wire-worms. The habits of the Wire-worms are very similar to those of the White Grub. They both live under the ground and their natural food consists chiefly of corn, cereals and grasses, but in the absence of these they attack many other kinds of plants. The adults of Wire-worms are Click-beetles.

Selection of land for planting, rotation of crops and fall plowing are the most important defensive methods.

Grasshoppers and related species. All of these are general feeders and are sometimes very destructive in a season favorable to their multiplication.

Breaking up their breeding places by plowing up old, dry pastures and stubble fields, where they have laid their eggs, is recommended.

MITES (RED SPIDER). Nearly all vegetables are attacked by Mites. They are very minute animals, usually not much larger than a pin-head. In dry seasons, such as the past, they become excessively numerous and do considerable damage.

Flowers of sulphur mixed with water in the ratio of one ounce to the gallon sprayed over the plants is the best remedy.

SLUGS are soft bodied arthropods, usually found in moist places.

Salt and lime dusted over the affected plants is recommended.

A MEMBER: What do you do for the aphis in the greenhouse?

A MCMEANS: We use Aphis punk; it costs 5 cents a sheet, and we use three sheets for 15,000 feet capacity.

F. F. REEVES: I have found great trouble in getting rid of lettuce aphis.

T. G. JARVIS: I like the spray motor attachment that sprays out from both sides. The knapsack sprayer has a bent nozzle, and you can get at them from underneath by using it.

A MEMBER: We grow from six to eight acres of Musk Melons and use tobacco stems. We soak them in water and then spray on the leaves.

J. LOCKIE WILSON: I am sure we have listened to the splendid addresses with a great deal of pleasure and we are indebted to the speakers for the excellent way in which they have laid the different subjects before us. We are also very much indebted to the council of the City of Toronto for their great kindness in allowing us the use of this hall, and I have much pleasure in moving a vote of thanks to them for giving us, free of charge, this suitable room in which to hold our convention.

This was seconded, and carried.

A hearty vote of thanks to the gentlemen who addressed the convention was carried unanimously.

The meeting then adjourned.

BEST TIME FOR SOWING ONION SEED.

With a view to determining the proper date for sowing Onion seed, a quantity of seed of Yellow Danvers and Golden Globe varieties was procured in the spring of 1908 and sent out to a number of growers in different parts of the Province with a request that a sowing of it be made as early in spring as the soil could be worked, a second sowing ten days later, and a third ten days later than the second. Reports were received from most of the growers, which are appended in tabulated form. It will be noticed that the weight of evidence is very strongly in favor of early sowing.

RESULT OF EXPERIMENTS.

Names and Address of Experimentor	Date of 1st Sowing	Date of 2nd Sowing	Date of 3rd Sowing	Length of Row in Each Case	Previous Crop	Fertilizer Used	Date of 1st Plants Up	Date of Full Stand	Date of Thinning, if any.	Date of Harvest	Weight of Marketable Bulbs from 1st Sowing	Weight of Marketable Bulbs from 2nd Sowing	Weight of Marketable Bulbs from 3rd Sowing	Weight of Culls from 1st Sowing	Weight of Culls from 2nd Sowing	Weight of Culls from 3rd Sowing	Any Disease or Insects	How Treated	Remarks
F. F. Reeves, Humber Bay.	May 9	May 19	June 2	100 ft.	Parsnips.	(a)	May 20	May 23	.....	Sept. 1	182	150	....	....	....	All	Blight and onion maggot.	No effective treatment known.	I think it would be well to try this experiment again.
F. Whithall, London West	May 20	June 1	.....	100 ft.	Cabbage.	....	May 27	May 30	.....	Sept. 25	109	100	....	..	30	....	.....	.....	Both small and poor bulbs are included in culls.
John A. Campbell, Leamington, Ont.	Apr. 27	May 7	May 18	.....	Onions...	....	.....	.....	.....	Oct. 15	....	....	....	....	....	....	.....	... .	Proper time for seeding in this district, April 15 to May 1st.
H. S. Peart, Jordan Harbor	May 5	May 15	May 28	100 ft.	Oats. ...	(a)	.....	.....	.....	Oct. 4	74	53	51¼	....	....	....	.....	.....	The dry season was most unfavorable for rapid growth.
Fred Collins, Chatham....	May 4	May 18	.....	.....	Parsnips.	...	.....	.....	.....	.....	....	....	....	....	....	....	.....	.....	Seed received very late for sowing in this district.
I. A. Farquharson, Ottawa	May 16	June 1	.....	100 ft.	Cabbage.	....	May 21	May 26	.....	Sept. 29	208	....	....	....	67	....	Maggot.....	Drawing away the soil from the bulbs.	
Fred Smith, Scotland, Ont.	May 4	May 15	May 25	100 ft.	Onions...	(b) (a)	May 15	June 3	.....	Sept. 1	63	66	38	....	....	....	Maggot	No effective treatment known.	Onions sown on the 20th of April in this locality give twice the yield of those sown on May 4th.
A. McMeans, O.A.C., Guelph.	May 7	May 18	May 28	100 ft.	Peas.....	(a)	.....	.....	.....	Oct. 1	126	95	22	....	....	14			
Thos. Delworth, Weston...	May 6	May 16	May 30	100 ft.	Onions...	(a)	.....	.....	.....	.....	142	130	32	....	1	5	Blight.		
Thos. Tregunno, Hamilton, Ont.	May 1	.....	.....	.....	Cauliflo'r	(a)	May 9	.....	.....	Sept. 1	....	...	....	....	...	....	.....	.....	Seed came to hand too late for satisfactory results.
W. T. Macoun, C.E.F., Ottawa.	May 4	May 14	May 26	100 ft.	Potatoes..	....	May 20	.....	July 9	Sept. 17	36½	37	29	7¼	9	4	.....	.....	Yellow Globe Danvers. Crop very light owing to drought.

(a) Barnyard Manure. (b) Wood Ashes Salt.

DELEGATES IN ATTENDANCE AT THE ONTARIO VEGETABLE GROWERS' CONVENTION, 1908.

Delegate.	Address.
Adams, E. E.	Leamington.
Aymer, Geo.	Humber Bay.
Baker, C. Wesley	London.
Bell, J. S.	Peterboro.
Bethune, Prof. C. J. S.	Guelph.
Broughton, Hy.	Sarnia.
Brown, J. G.	Humber Bay.
Burton, M. E.	Hamilton.
Carpenter, G. H	Fruitland.
Dandridge, James	Mimico.
Davis, Robert	Hespeler.
Delworth, Thos	Weston.
Dickson, J. M.	Hamilton.
Dillon, Ed.	Ojibway.
Emory, W. A	Aldershot.
Farquharson, I. A.	Ottawa.
Fernley, J. M	Toronto.
Ferrie, Geo. M.	Cobourg.
Francis, Miss Edith	St. Catharines.
Fuller, F. G	London.
Gage, W. S.	Simcoe.
Glendinning, John	Vallentyne.
Green, G. deW.	Toronto.
Grieve, John	Seaforth.
Gutthrie, R.	Toronto.
Hayden, J. D	Cobourg.
Haynes, Lewis	St. Catharines.
Herold, Otto	Waterloo.
Hilborn, J. L.	Leamington.
Hodgetts, G. W	St. Catharines.
Hutt, Prof. H. L	O. A. C. Guelph.
Irwin, Robt.	Midland.
Jarvis, Prof. T. D.	O. A. C. Guelph.
Jnry, J. H. H.	Bowmanville.
Kustermann, C. H.	Waterloo.
Lamb, F. H.	Hamilton.
Lewis, R. H.	Hamilton
McCalla, W. J.	St. Catharines.
McKenny, A.	Essex.
McMeans, A.	O. A. C. Guelph.
McNeill, A.	Ottawa.
McTaggart, M. D.	Clinton.
Macoun, Prof. W.T.	Ottawa.
Martin, G. C	Tweed.
Mearns, Robt.	Toronto.
Moyle, Henry	Toronto.
Nicholson, Mrs. H. T.	St. Catharines.
Nicholson, Miss	St. Caiharines.
Patterson, F. G.	Winona.
Pearce, John S.	London.
Peart, H. S.	Jordan Harbour.
Pirie, Dr. A. T.	Cartage, Costa Rica, S. America.
Purdy, E. K	Cataraqui.
Radcliffe, Miss	St. Catharines.
Reeves, F. F.	Humber Bay.
Rose, J. T.	Brentford.
Rose, Miss A.	Guelph.
Rush, J. W	Humber Bay.
Scott, Rev. A. H.	Perth.
Seeley, W. O.	Dundas.
Seyler, W. H.	Toronto.
Sharman, John	Woodbank.
Spencer, Earl	Picton.
Tregunno, Thos.	Hamilton.
Trott, W. R.	London.
Turney, A. G.	O. A. C. Guelph.
Weaver, W. W.	&hatham.
Webb, Mrs. T.	St. Catharines.
Whitehall, F.	London.
Whyte, R. B.	Ottawa.
Wilson, J. Lockie	Toronto.
Winslow, R. M.	Picton.
Wistow, Thos.	London.
Woolverton, H. A.	Nelson, B.C.
Woolverton, Linus	Grimsby.

CONSTITUTION OF THE ONTARIO VEGETABLE GROWERS' ASSOCIATION.

Preamble.

The object of the Ontario Vegetable Growers' Association shall be to advance the interests of the vegetable industry in all its branches.

(*a*) By holding an annual convention for the consideration of questions relating thereto.

(*b*) By co-operating in every way possible with the branch Associations hereinafter provided for.

(*c*) By collecting, arranging and disseminating useful information.

(*d*) By co-operating in promoting the educational work of the Ontario Department of Agriculture.

(*e*) By awarding premiums at Horticultural Exhibitions.

(*f*) And by such other means as may from time to time seem desirable.

Constitution.

1. The Association shall be called The Ontario Vegetable Growers' Association.

2. The officers of the association shall be a president, a first and a second vice-president, a secretary, a treasurer, or a secretary-treasurer, and directors to be appointed as hereinafter provided, who shall constitute the board of directors.

3. Any person may become a member by the payment of 50c. per annum, payable in advance, and a payment of 10 shall constitute a life member. Members joining the association thus shall not be entitled to representation on the board of directors.

4. An annual convention shall be held each year at such time and place as may be designated by the directors.

5. The directors may appoint an honorary president, and an honorary first, and an honorary second vice-president, but such persons shall not have the power to vote at the meetings of the board of directors.

6. The election of directors shall take place each year, at the meetings of the branch associations (hereinafter provided for and as defined in Clause 25, governing branch associations), the newly-elected directors to assume their duties and responsibilities at the close of the said meetings.

7. The directors shall, at the first meeting of the board, and afterwards whenever necessary, appoint from among themselves a president and a first and a second vice-president.

8. An annual meeting of the board of directors shall be held each year at least one month previous to the date set for the annual meetings of the branch associations. At such meeting the directors shall prepare a statement of the year's work as outlined in clause 11, for presentation at the annual meetings of the branch associations.

9. The directors, also, shall appoint from among themselves, or otherwise, a secretary and a treasurer, or a secretary-treasurer, who shall remain in office during pleasure.

10. The directors may elect from among themselves an executive committee, not exceeding five members (including the secretary), which shall have the right to conduct such business of the association as the directors may, by resolution, specify, of which committee three shall constitute a quorum.

11. At each annual meeting of the branch associations the retiring directors shall present a full report of their proceedings, and of the proceedings of the Provincial Association, and a detailed statement, for the previous year, of the assets and liabilities, and of the receipts and expenditures of said association, and a statement of membership and such general information, pertaining to the Provincial Association, as the members of their branch associations may desire.

Quorum.

12. Not less than five members shall constitute a quorum to transact business for the association.

13.—(1) At least two weeks' notice shall be given previously of each general or annual meeting, naming the time and place of meeting. Notices must be mailed to each director by the secretary.

(2) A meeting of the executive may be held on shorter notice, provided every member is otherwise notified and consents thereto.

Duty of Officers.

14. It shall be the duty of the president to preside at all meetings of the association, decide all questions of order, and make suggestions he may deem necessary in the interests of the association, and he shall be an *ex-officio* member of all committees appointed. The president shall remain in office until his successor is appointed, and he shall attend the first meeting of the new board of directors.

15. It shall be the duty of the vice-presidents to aid and assist the president. In the absence of the president his powers and duties shall devolve upon the first and the second vice-presidents in the order named.

16. It shall be the duty of the secretary to attend all meetings of the association, and keep correct minutes of the same; conduct all correspondence, and issue all press and other reports; prepare the report of the executive committee for the annual meeting; forward the list of representatives to the secretaries of the Fair Associations, and prepare for publication the annual report. He shall have the power of managing director, acting under the control and with the approval of the board of directors. The secretary shall call the first meeting each year, of the new board of directors, within six weeks after the date set for the annual meetings of the branch associations. By virtue of his office he shall be a member of each committee appointed.

17. The treasurer shall receive and account annually, or as often as may be required by the board, for all moneys belonging to the association, which shall be deposited in a chartered bank approved by the association, and he shall pay by cheque, all bills and accounts that have been approved of by the executive.

18. All receipts and expenditures of the Association for the year shall be audited before the annual meetings of the branch associations, by an auditor to be appointed on the request of the association, by the Minister of Agriculture, the expenses of such

audit to be borne by the association. A true copy of such auditor's report shall be presented at the annual meetings each year of the branch associations.

19. This constitution may be amended or revised by a majority of the members present at an annual meeting, provided a notice of motion of such change has been given in the notices calling the meeting, or at a special meeting of the directors of the association called for the purpose of considering the same.

PROVISIONS FOR THE AFFILIATION OF BRANCH ASSOCIATIONS.

Preamble.

The objects of the branch Ontario Vegetable Growers' Associations shall be those set forth in the preamble of the Ontario Vegetable Growers' Association.

20. A branch association may be formed in any part of Ontario.

21. Each branch association shall be called The ..... Branch of the Ontario Vegetable Growers' Association.

22. The membership fee of each branch association shall be fifty cents per annum, of which sum ten cents per member must be forwarded to J. Lockie Wilson, Treasurer of the Central Organization, and the balance of forty cents retained by the local branch.

23. Local associations may affiliate with, and become branches of The Ontario Vegetable Growers' Association when they have a membership of ten, upon the payment to the treasurer of the Provincial Association of ten cents per member, which payment shall constitute the members of said associations members of the Provincial Association, and shall entitle them to free copies of the report of the annual convention and such other printed material as may be issued by the Provincial Association, and shall entitle each branch association to representation on the board of directors of the Provincial Association upon the terms defined in clause 25.

24. The annual meetings of branch associations shall be held during the first week of December each year.

25. Branch associations, at their annual meetings, shall appoint directors of the Provincial Association as follows:—

(*a*) A branch association having at least ten members, but less than fifteen, shall appoint one director, but the expenses of said director when attending meetings of the board must be paid by the branch.

(*b*) A branch association having fifteen members and less than twenty-five, shall appoint one director, whose expenses when attending meetings of the board, shall be paid by the Provincial Association.

(*c*) A branch association having more than twenty-five members may appoint one director, whose expenses when attending meetings of the board, shall be paid by the Provincial Association, or may appoint one director for every twenty-five members of the branch, but on condition that the association shall pay the expenses of only one director for the branch while attending board meetings.

(*d*) At all board meetings of the Provincial Association the director or directors present, representing any branch shall have the right to cast one vote for every twenty-five members of their branch.

Thirty-Ninth Annual Report

OF THE

Entomological Society

OF ONTARIO

1908

Published by the Ontario Department of Agriculture, Toronto.

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1909

Printed by WARWICK BRO'S & RUTTER, Limited, Printers,
TORONTO.

To the Honourable JOHN MORISON GIBSON, K.C., LL.D., etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present herewith for the consideration of your Honour the Report of the Entomological Society of Ontario for 1908.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1908.

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Erratum.—On page 54, J. W. Eastham should read A. Eastham.

Thirty-Ninth Annual Report

OF THE

Entomological Society of Ontario,

1908.

To the Honourable James S. Duff, *Minister of Agriculture.*

Sir,—I have the honour to present herewith the Thirty-ninth Annual Report of the Entomological Society of Ontario, which contains the proceedings of the forty-fifth annual meeting of the Society which was held at the Agricultural College, Guelph, on the 5th and 6th of November, 1908. A full account is given of the discussions upon fruit-tree insects that took place, the papers that were read and the reports of the various officers and branches of the Society.

"The Canadian Entomologist," the monthly magazine of the Society, has been regularly issued during the past year and has now completed its fortieth volume. Its high scientific standard has been steadily maintained.

I have the honour to be, Sir,

Your obedient servant,

Charles J. S. Bethune,

Editor.

Ontario Agricultural College,
Guelph.

Entomological Society of Ontario.

OFFICERS FOR 1908-1909.

President—Tennyson D. Jarvis, B.S.A., Lecturer in Entomology and Zoology, Ontario Agricultural College, Guelph.

Vice-President—Edmund M. Walker, B.A., M.D., Lecturer in Biology, University of Toronto.

Secretary-Treasurer—J. Eaton Howitt, B.S.A., Demonstrator in Botany, O. A. College, Guelph.

Curator—Lawson Caesar, B.A., B.S.A., Demonstrator in Entomology and Plant Diseases, O. A. College, Guelph.

Librarian—Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Professor of Entomology and Zoology, O. A. College, Guelph.

Directors—Division No. 1, Arthur Gibson, Department of Entomology, Central Experimental Farm, Ottawa; Division No. 2, C. E. Grant, Orillia; Division No. 3, J. B. Williams, Toronto; Division No. 4, C. W. Nash, Toronto; Division No. 6, R. S. Hamilton, Collegiate Institute, Galt.

Directors (Ex-Presidents of the Society)—Professor Wm. Saunders, C.M.G., LL.D., F.R.S.C., F.L.S., Director of the Experimental Farms of the Dominion of Canada, Ottawa; Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Guelph; W. Hague Harrington, F.R.S.C., Ottawa; Professor John Dearness, Vice-Principal Normal School, London; Henry H. Lyman, M.A., F.E.S., F.R.G.S., Montreal; Rev. Thomas W. Fyles, D.C.L., F.L.S., Levis, P. Q.; Professor Wm. Lochhead, B.A., M.S., Macdonald College, P. Q.; John D. Evans, C.E., Chief Engineer, Central Ontario Railway, Trenton.

Editor of the "Canadian Entomologist"—Rev. Prof. Bethune, Guelph.

Delegate to the Royal Society—Arthur Gibson, Ottawa.

Auditors—Prof. McCready and J. W. Crow, B.S.A., O.A. College, Guelph.

CANADIAN MEMBERS OF THE ENTOMOLOGICAL SOCIETY.

Province of Ontario.

Abbott, Dr. A. R ..... Toronto.
Aiton, Miss A ..... Highland Creek.
Albright, W. D ..... London.
Baker, A. C., O.A.C ..... Guelph.
Baker, A. W., O.A.C ..... "
Bethune, Prof., C.J.S., O.A.C.. "
Black, Davidson ..... Toronto.
Blackmore, Miss E ..... "
Bock, H. P ..... London.
Bowman, J. H ..... "
Brodie, Dr ..... Toronto.
Brown, Walter ..... "
Buchanan, Dr. G. C ..... Beamsville.
Caesar, Lawson, O.A.C. ..... Guelph.
Calvert, J. F ..... Orangeville.
Cockburn, Miss A ..... Hillside,
Coleman, R. E ..... Toronto.
Collingwood, J. H ..... Kintore.
Cosens, A ..... Toronto.
Creelman, Pres't, O.A.C ..... Guelph.
Dearness, Prof. J ..... London.
Dunlop, James ..... Woodstock.
Eastham, J. W., O.A.C ..... Guelph.
Elliott, W. H ..... Toronto.
Evans, J. D ..... Trenton.
Fisher, George E ..... Freeman.
Fletcher, Dr. James ..... Ottawa.
Fraser, W. J ..... Toronto.
Frier, G. M., O.A.C ..... Guelph.
Gibson, Arthur ..... Ottawa.
Grant, C. E ..... Orillia.
Groh, H ..... Ottawa.
Hahn, Paul ..... Toronto.
Haight, D. H ..... Sudbury.
Hallam, M ..... Toronto.
Hallam, R ..... "
Hamilton, R. S ..... Galt.
Harrington, W. H ..... Ottawa.
Holland, W. H ..... Toronto.
Howitt, J. E., O.A.C ..... Guelph.
Ivy, M ..... Toronto.
Jarvis, T. D., O.A.C ..... Guelph.
Johnston, James ..... Hamilton.
Jones, D., O.A.C ..... Guelph.
Kilman, A. H ..... Ridgeway.
King, R. W ..... Toronto.
Laing, J ..... Toronto.
Law, John ..... London.
Lawrence, C. A., O.A.C ..... Guelph.
Matthews, J. S ..... Toronto.
Maughan, J., Jr ..... Toronto.
McCready, Prof. S. B., O.A.C.. Guelph.
McMillan, G. O ..... Glenallan.
McRitchie, A. R ..... Kincardine.
Moore, T. J ..... Guelph.
Morden, J. A ..... Hyde Park Corners.
Morris, F. J. A ..... Port Hope.
Mosey, Miss ..... Toronto.
Nash, C. W ..... "
Pearson, Gerald ..... London.
Readwin, R ..... Guelph.
Richard, A. E ..... Ottawa.
Saunders, H. S ..... Toronto.
Saunders, W. E ..... London.
Silcox, Sidney ..... Toronto.
Slater, A. E ..... Port Hope.
Smith, Arthur ..... Toronto.
Stafford, E. W., O.A.C ..... Guelph.
Tanton, John ..... Kingston.
Thompson, W. Robin, O.A.C .. Guelph.
Tothill, J. D., O.A.C ..... Guelph.
Treherne, R. C., O.A.C ..... "
Walker, Dr. E. M ..... Toronto.
Watson, Dr. A. H. R ..... Port Hope.
Webb, J. H ..... Toronto.
Wheaton, R. R., O.A.C ..... Guelph.
White, James ..... Snelgrove.
Williams, J. B ..... Toronto.
Wood, S. T ..... "
Young, C. H ..... Ottawa.
Zavitz, E. J., O.A.C ..... Guelph.

Province of Quebec.

Barwick, E. C ..... Montreal.
Begin, Rev. Abbe, P. A ..... Sherbrooke.
Bickell, Miss ..... Quebec.
Boulton, A. R. M ..... "
Boulton, Capt. J. G ..... "
Boulton, Mrs ..... "
Bowen, Miss ..... "
Brainerd, Dwight ..... Montreal.
Brainerd, H ..... "
Burgess, Dr. T. J. W ..... Verdun.
Campbell, J. G ..... Magog.
Chagnon, Gustave ..... Montreal.
Clark, Rev. Wylie, C ..... Quebec.
Denny, E ..... Montreal.
Dunlop, G. C ..... "
Elliott, W. R ..... Sherbrooke.
Faulconer, Mrs ..... Levis.
Faulconer, Miss Clare ..... "
Fosberry, C. S ..... Montreal.
Freeman, Miss I. H ..... Quebec.
Fyles, H ..... Levis.
Fyles, Miss W ..... "
Fyles, Mrs ..... "
Fyles, Rev. Dr. T. W ..... "
Geggie, James ..... Beauport.
Geggie, Miss Lois ..... "
Gibb, Lachlan ..... Montreal.
Griffin, A ..... "
Hamel, Miss Julia ..... Levis.
Hedge, Miss Louisa ..... "
Huard, Rev. Victor ..... Quebec.
Johnston, Miss M. G ..... Bedford.
Kollmar, E. J ..... Montreal.
Lindsay, Col. Crawford ..... Quebec.
Lochhead, Prof ..... Macdonald College.
Lyman, H. H ..... Montreal.
MacLeod, Miss E ..... Quebec.
Moore, G. A ..... Montreal.
Norris, A. E ..... "

CANADIAN MEMBERS—*Continued.*

Poston, Mrs. T. A .....Levis.
Reford, L .....Montreal.
Robertson, Miss.....Quebec.
Seton, Mrs. W. W.....Levis.
Simmons, J. H ..... "
Simmons, Mrs. J. H ..... "
Southee, G. R.....Outremont.
Swaine, J. M .....Macdonald College.
Tourchot, A. L .....St. Hyacinthe.
Turnbull, Lt.-Col. F.....Quebec.
Turner, Hon. Richard.... "
Turner, Mrs. R..... "
Wade, Miss.....New Liverpool.
Weir, Douglas .....Montreal.
West, Dr. J.....Magog.
Winfield, Mrs.....Quebec.
Winn, A. F .....Montreal.
Wood, Rev. Edmund..... "

ALBERTA.

Baird, Thos.....High River.
Dod, F. H. Wolley .....Millarville.

BRITISH COLUMBIA.

Abercrombie, Miss Ivy .....Vancouver.
Anderson, E. M .....Victoria.
Anderson, J. R..... "
Armstrong, E. W.....Salmon Arm.
Bryant, T .....Ladysmith.
Bush, A. H .....Vancouver.
Cockle, J. W .....Kaslo.
Danby, W. H .....Rossland.
Dashwood-Jones, W. H .....New Westminster.
Day, G. O .....Duncan's Stn.
Draper, R .....Hillcrest.
Elliott, B. R.....Victoria.
English, T. M .....Cowichan Stn.
Foster, F .....Vancouver.
Grassham, R. T.....Keithly Cr'k.
Hanham, A. W .....Duncan's Stn.
Harvey, R. V .....Victoria.
Keen, Rev. J. H.....Metlakatla.
Livingston, C .....Duncan's Stn.
Luscombe, P.....Cowichan Bay.
Marrion, H.....Vancouver.
Mason, J., G.T.P .....Copper River.
Reed, E. Baynes.....Victoria.
Sherman, R. S.....Vancouver.
Skinner, E. M.....Duncan's St'n.
Taylor, Rev. G. W .....Departure Bay, Nanaimo.
Towler, J.....Vancouver.
Van Steenweyk, Miss ..... "
Venables, E. P ....Vernon.
Wilmot, E. S..... "
Wilson, T ....Vancouver.

MANITOBA.

Criddle, Norman .....Aweme.
Dennis, A. J .....Miniota.
Heath, E. F .....Cartwright.
Hunter, Rev. A. J.....Teulon.
Wallis, J. B .....Winnipeg.

NOVA SCOTIA.

Hervey, C. L. G.....Round Hill.
Mackay, Dr. A. H.....Halifax.
Payne, H. G.....Granville Ferry.
Russell, John.....Digby.

SASKATCHEWAN.

Croker, A. J.....Redvers.
Willing, T. N.....Regina.

HONORARY MEMBERS.

Cockerell, Prof. T. D. A ....Boulder, Col.
Cresson, Ezra T.....Philadelphia, Pa.
Edwards, Wm. H .....Coalburgh, W. Va.
Howard, Dr. L. O .....Washington, D.C.
Scudder, Dr. S. H.....Cambridge, Mass.
Smith, Prof. J. B .....New Brunswick, N.J.
Uhler, P. R .....Baltimore, Md.
Webster, F. M.....Washington, D.C.
Wickham, Prof. H. F .....Iowa City, Iowa.

LIFE MEMBER.

Saunders, Dr. William .....Ottawa.
Director of the Experimental Farms of the Dominion.

Entomological Society of Ontario.

ANNUAL MEETING.

The forty-fifth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 5th and 6th, 1908. Owing to the lamented absence of the President, Dr. James Fletcher, in consequence of serious illness, which terminated fatally on the following Sunday, the chair was taken by the Vice-President, Mr. Tennyson D. Jarvis, Lecturer in Entomology and Zoology at the O. A. College. Among those present were Rev. Dr. Fyles, Quebec; Mr. Henry H. Lyman, Montreal; Prof. W. Lochhead, Macdonald College, Ste. Anne de Bellevue; Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. F. J. A. Morris, Trinity College School, Port Hope; Messrs. C. W. Nash, J. B. Williams and Dr. Brodie, Toronto; Mr. Calvert, Orangeville; Mr. Collingwood, Kintore; President Creelman, Professors Zavitz, Hutt, Bethune, Messrs. Howitt, Eastham, Crow, Caesar, Klinck, McMeans and others, Guelph. There were also present a large number of students from the College, and on the Thursday evening of young women students also from the Macdonald Institute. The Society was favored with the presence of Dr. E. P. Felt, of Albany, State Entomologist of New York. Letters expressing regret at their absence were received from Prof. C. C. James, Deputy Minister of Agriculture, Directors C. E. Grant, Orillia; G. E. Fisher, Burlington; and C. H. Young, Ottawa; Dr. E. M. Walker, Toronto; Mr. John D. Evans, Trenton; Mr. A. F. Winn, Montreal; Mr. J. H. Bowman, London, and others.

During the first morning a business meeting of the Council was held at the Wellington Hotel, Guelph, at which their report was drawn up, and various matters discussed. It was decided to permit the formation of Nature Study Clubs in affiliation with the Society at any school in the Province on condition that there should be at least six members and that each Club should pay one dollar a year as a subscription to the funds of the Society; in return each Club should receive one copy of the issues of the "Canadian Entomologist" and a copy of the Annual Report for each individual member. The Society would also endeavour, on request, to send a representative to deliver a lecture on some natural history subject once a year if practicable. The following resolution of sympathy with Dr. Fletcher in his illness was adopted and a copy was sent to Mrs. Fletcher in order that it might be communicated to him.

"The members of the Entomological Society of Ontario have heard with deep regret of the serious illness of their esteemed President, Dr. James Fletcher, and of his enforced absence from this annual meeting.

"They desire to convey to Dr. Fletcher their earnest hope that his illness will be of no long duration and that he may soon be restored to health and strength. They beg to assure him of their warm sympathy with him in his sufferings and the interruption to his useful work."

The afternoon meeting was held in the spacious Massey Hall at the College and was largely attended. Mr. Jarvis took the chair at 2 o'clock and called upon the Directors of the Society to read their reports on the noteworthy insects of the year in their respective divisions. Mr. Fisher sent a letter explaining his inability to prepare a report for Division No. 5 owing to the pressure of business, and there was no report from No. 6 in consequence of the lamented death of the Director, Mr. J. A. Balkwill, which took place at London on October 10th.

REPORTS ON INSECTS OF THE YEAR.

Division No. 2.—Midland District. By C. E. Grant, Orillia.

The season of 1908 was a beautiful one, the finest summer I think I ever saw, but still there was no great outbreak of injurious insects and in fact no insects were particularly abundant as noted by me. On account of the small amount of rain in this section the plant lice were rather plentiful; I saw a field of turnips in September which were practically covered with them, but still the turnips were above the average size and the owner of the farm stated that he had taken no measures to kill them off.

Another insect, the yellow-necked apple-tree caterpillar, (*Datana ministra*) was remarkably abundant, some apple trees were nearly stripped of their leaves in the gardens around the town and the moths came in droves to my lamp.

The Buffalo beetle nuisance seems to be increasing, nearly all housewives are complaining of it and it seems hard to devise a perfect remedy for it.

Heliothis armiger is another insect which has been complained of as affecting the corn; the moths were flying in the day time over a clover field I visited in September and October along with *Plusia brassicæ*; I took both species in numbers; there had been corn grown in the next field.

This season I purchased a 7 amp. multiple lamp and had it installed on my verandah, the results were wonderful as to the number of insects attracted; the bombardment of *Lachnosterna fusca*, June beetles, in the spring was more than anyone but an Entomologist could stand and every now and then the deeper hum of *Belostoma americana*, the giant water-bug, would be heard, as this great bug thumped down on the verandah; during the month of June there was a constant and ever-changing stream of insect life. Unfortunately our power had to be shut down from the middle of July to the end of August, thus spoiling my sport. I got, however, several good things such as *Caripeta discivaria, Syneda Alleni, Apatela quadrata*, two new Plusias, *Oreta rosea*, and five or six *Eacles imperialis*. I took twelve species of Hawkmoth, the rarest here being *Smerinthus myops cerisyii* and *Sphinx luscitiosa;* one very handsome *Heterocampa* was also taken, if not *astarte*, it is very much like it. A new *Crocota* and several good things not, however, new to me such as *Mamestra nimbosa* and *latex*, and others too numerous to mention. If I had been present at the meeting I should have liked to have given a longer account of the numerous species attracted but as the directors are supposed to confine their report to injurious insects I will at some other time give a fuller list of what can be taken at Orillia, if it is thought desirable. I might mention one other capture in the daytime, namely, *Anisota virginiensis* (or *stigma*) taken on the edge of a wood flying about ten feet from the ground in the bright sunshine. *Junonia cœnia* was rather plentiful; I took four specimens in two weeks, *Colias eurytheme* was also taken several times.

Division No. 3—Toronto District. By J. B. Williams.

I am not able to report very much this season as I was away in England most of the summer.

The Tussock Moth did a good deal of damage to the shade trees in Toronto. I noticed, in September, that a large part of many trees had been nearly stripped of their foliage. The late Park Commissioner, Mr. Chambers, always said that in many streets it was almost useless collecting

cocoons because in adjoining private grounds the trees were infested with them, and the owners took no trouble to check their increase.

Our new Commissioner, Mr. Wilson, is getting a by-law passed to enable him to collect the cocoons on private grounds, as well as on the streets, and he has a grant of $5,000 for the work this winter; so we may expect to see some decided improvement in a year or two, if the work is thoroughly carried out.

Last year there was an almost total absence of Walking Stick Insects (*Diapheromera femorata*), in Niagara Glen, but this year they again appeared in countless hosts; some trees were quite stripped of their foliage by them, and they kept falling in numbers on the heads and shoulders of any passers-by in parts of the Glen where they were most numerous. Probably the cold weather in May and June last year prevented the eggs from hatching, and so they all lay over until the second year, as they are sometimes known to do, and then produced an especially numerous and voracious crop of Walking-sticks.

Division No. 4—East York District. By C. W. Nash, Toronto.

In April last I attended two meetings of Horticulturists at Oakville. At these meetings the insect pests which infested the orchards of the vicinity were thoroughly discussed. Among those mentioned as being particularly destructive was the Tree Cricket. This insect is now very abundant in raspberry plantations and was said to do more harm in that locality than any other pest they had. Raspberry growers in other districts should be on their guard against this Cricket for where it becomes established it is somewhat difficult to control and it is capable of doing much mischief.

Although the early spring was cold and apparently unfavorable to insect life yet, when on April 12th I was cleaning up my garden, I found that under the shelter of the dead leaves which laid thickly over the flower beds, many forms were snugly and safely tucked away, waiting for warmth and sunshine to start them upon their summer activities. At the base of some of my shrubs small adult Lady beetles were very abundant; these I was not surprised to find, for like many others of their order, they hibernate in the adult stage, but when clearing up some hardy carnation plants, I was not only surprised but somewhat disgusted at finding upon them a large number of nearly full grown wingless green Aphids. That many species of Aphids hatch early and grow rapidly, I am well aware but this was the first time I had ever seen lively well-grown specimens flourishing when surrounded with ice crystals, upon plants which were still saturated with water from melting snow.

On May 5th from beneath a heap of dead leaves I raked out a handsome Red Admiral butterfly. It was living but very listless and weak.

Although for several years I have kept a sharp lookout, east of Toronto, for the Red Asparagus beetle I did not find it. This year, however, it appeared and by the end of the season outnumbered in some places the common Blue species. Both forms were abundant on the plants at the same time. The Red is much the more active of the two, flying off instantly when an attempt is made to capture it.

The Hunting Beetles (*Calosoma*) appeared to be much more abundant this year than usual, *C. calidum* especially being particularly common about the end of June.

Cosmopepla carnifex, which for the past three years had been steadily increasing in number, was entirely absent; I did not see one anywhere during the whole season. The Rose Beetle, too, has disappeared. This I can

account for as the sparrows hunt for them most persistently and feed them to their young when in the nest. It may be that they also feed upon Cosmopepla but I have seen no evidence of it.

The Monarch butterfly did not make its appearance this year in this district until late. On July 8th I saw the first, a single one, very much worn and dull colored. On the 11th I counted about a dozen between Toronto and Highland Creek, a distance of sixteen miles; these were old and much worn. On the 20th of August new, fresh specimens were common and soon were mated.

Usually the migration of this species is at its height during the first week in September, after which but few stragglers are seen. This year I saw no migration in large flocks at all and stragglers were fairly common as late as the first of October, and the last was seen on the fifth.

House-flies have been comparatively scarce this summer and so were Mosquitoes until the evening of July 8th when they became fairly abundant, but at no time during the season have they swarmed in their usual hosts. Most of those examined were parasitized by mites, but this does not prevent their doing business in their good old fashioned way.

The Stalk borer (*Gortyna cataphracta*) was more abundant and destructive than ever before. This year I found the first young larva in the blossom stem of an Iris on the 15th of June. The larva was rather less than a quarter of an inch long and had evidently entered by boring a hole from the outside at about nine inches from the ground. As in 1907 I gave the full life history of this pest as far as I know it, I need not repeat it. No parasites have yet been bred by me from the larvæ of this moth, though I have carried a great many of them through to the imago stage.

While *Gortyna cataphracta* is a much dreaded pest in a flower garden, yet the damage it does rarely extends to the entire destruction of a plant; the affected stems are killed but the root is uninjured. All members of the genus are not, however, so considerate, for some of them work into the root-crown or the roots and thereby cause the death of the plant affected.

This summer I noticed that all my plants of *Aquilegia chrysantha* looked sickly and they scarcely threw out a healthy blossom. On August 20th the plants appeared to be dead. Upon pulling away the stalks which came off easily, the upper part of the fleshy roots was found to be hollowed out. A search in the soil yielded two chrysalids; they were lying about four inches from the roots and about two inches beneath the surface of the earth. These I took in and from them, on the 5th and 8th of September, moths emerged which are, I believe, *Gortyna purpurifascia*. One of them, shortly after emerging, deposited a number of eggs singly upon the surface of the soil in the jar where the moths were bred out.

If this moth becomes common, Aquilegia growers will require to look out for its larvæ or they will lose their plants. Strange to say while all my *chrsanthas* were destroyed, no other variety of Aquilegia was attacked.

Although I have grown Aquilegias for many years in Ontario, I have never before had one attacked by this insect nor have I ever seen any others so affected in this district.

I am sorry to say that at last I have positive proof that the San José scale has become established on the north shore of Lake Ontario. As yet, however, there are only two or three orchards infested, but past experience has shown that unless proper precautions are taken the pest will rapidly spread.

This year the Tussock Moth larvæ were about as abundant as usual. On the 13th of July I saw many spinning cocoons, at the same time there

were numbers of them not more than a quarter of an inch long. Could the cold backward season have delayed the hatching of the eggs in some cases?

Although I have since 1887 paid a good deal of attention to this insect and each year have bred large numbers of them I had found but few parasitized. This season, however, in some parts of the City of Toronto it was the exception to find a pupa free from parasites, the chief of these being *Pimpla inquisitor*. As I have brought a number of specimens of the various parasites bred from the Tussock Moth larvæ which we can discuss at leisure, I need make no further reference to them now.

THE WHITE-MARKED TUSSOCK MOTH.

By Paul Hahn, Toronto.

Being asked by our President, Dr. Fletcher, to deliver a report regarding the extermination in Toronto of the white-marked Tussock Moth (*Hemerocampa leucostigma*), which has done so much damage to our shade trees, allow me to state the following. (Fig. 1.)

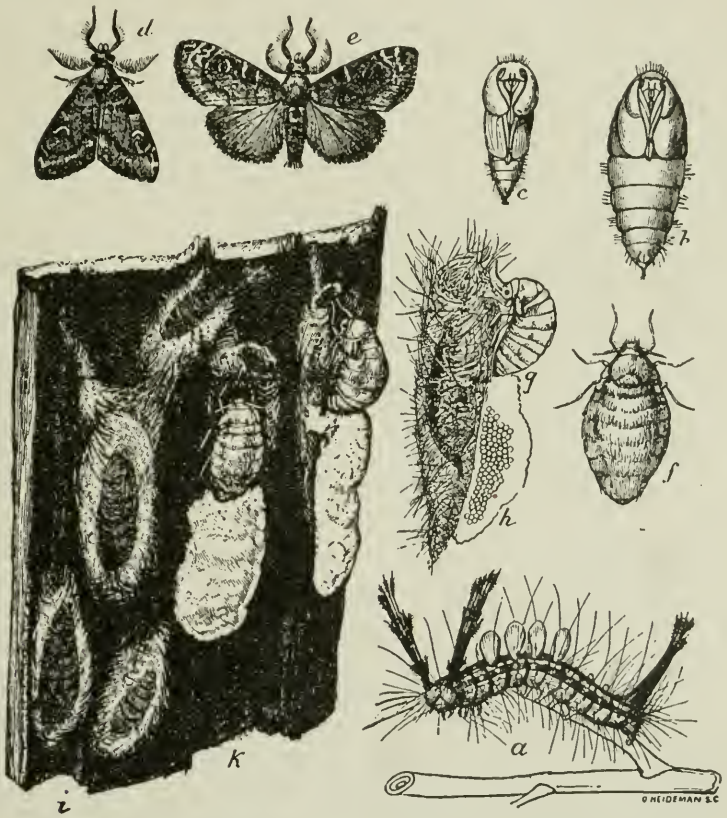

Fig. 1. Tussock Moth: *a* caterpillar; *b* and *c* chrysalids; *d* and *e* male moths; *f* and *g* wingless female moths; *h* eggs; *i* male cocoons; *k* female moths and egg masses on cocoons.

Two years ago noticing that this insect had done considerable harm to our beautiful trees I called on the Mayor and the Park Commissioner of our city.

I advised them strongly to collect the egg-masses and urged them to get a special permit from the Government to pass a by-law compelling citizens to rid their trees of these egg-masses.

Very soon after this visit I took ill and was unable to follow up the matter, having to go out of town for quite a long time. Last year I thought again about taking up the matter, but being still in poor health I had to abandon the idea.

I made out a report, called on the Board of Control, and bringing the matter up most forcibly at their meeting I persuaded them to give the Park Commissioner a grant of $5,000 to enable him to clean the city trees of these egg-masses, at the same time urging the passing of the by-law compelling the citizens to clean their trees.

On receipt of the grant of $5,000 the Park Commissioner at once sent out several gangs of men and they did splendid work in the infested places.

About October 1st the by-law was passed and it was published in all the papers, giving the citizens ten days' notice to have their trees cleaned. Should the property holders not comply with this request the city has full power to enter upon the premises, do the work and charge it up to the citizens. This charge to be levied and collected with the local improvement rates for the current year or other municipal rates.

Should it be necessary the Park Commissioner will engage the school-children again to collect the caterpillars and give them so much per quart, and if needed some spraying will also be done.

With the above method I feel sure the pest will be wiped out.

Dr. Bethune expressed his gratification at the success which Mr. Hahn had achieved in at length persuading the Board of Control in Toronto to adopt proper methods of dealing with the Tussock Moth trouble. It was a disgrace to the city that this insect should have been permitted for so many years to ravage the horse chestnut and other shade trees; the failure to deal properly with the pest was due to the late Park Superintendent who would not take the advice of Entomologists but adopted methods of his own, which were perfectly useless.

Mr. Nash: I have this to say that I think the whole trouble in Toronto may be very fairly charged to the late Park Superintendent. It was in 1887 that I first noticed the Tussock Moth in Toronto, and I called his attention to the fact, and he then gave me to understand that he knew all about it, that he required no advice nor assistance, and that he would do as he pleased in the matter. I think about the same time I spoke to Dr. Brodie and he said that he and other members had endeavoured to do something and that they had failed. However, from that time on the Tussock Moth increased. Application was then made for funds and every year he has been supplied with three or four thousand dollars. He could have used that money to very good advantage, but as a rule it was simply thrown away. They waited until the larvæ were about to spin their cocoons and he then expected to kill the insects by putting poisons on the foliage long after the caterpillars had ceased to eat. However, we have now a thoroughly educated man in charge of our parks, one capable of judging and observing for himself and willing also to take the advice of those who are experienced. It is not possible for us now to exterminate the Tussock Moth; it has spread all through the woods and is all over the country. I found it on Manitoulin Island and on St. Joseph's Island where it had done an immense amount of mischief. As everyone knows the egg-masses must be destroyed and this can very easily be done during the winter months.

CONFERENCE ON THE CHIEF INSECT PESTS OF THE SEASON.

The Leaf Blister Mite.

The Chairman, Mr. T. D. Jarvis, announced that the rest of the afternoon would be devoted to a discussion of some of the chief insect pests of the season, taking up especially those injurious to fruit culture. The first to which he would draw the attention of the meeting was the Leaf Blister Mite (*Eriophyes pyri*) which attacks the foliage of the pear and apple, and has during late years slowly and steadily spread throughout Ontario. It is an almost microscopical mite and by its attacks causes little blisters to appear which become dark brown on the under side of the leaves.

Mr. Caesar showed some mounted specimens of the Blister Mite and stated that they are to be found on the under side of pear and apple leaves on which they produce dark swellings which look like a fungus disease. In travelling through the province this year he had found this Blister Mite in the Niagara district, at St. Catharines, Grimsby and other places; also in Essex county, some in Norfolk, a great deal in Prince Edward county, a considerable amount in Peel county. In his own home orchard in Peel county were some pear trees that had hardly a single leaf that was not covered with the work of the Mite. A year ago here at the College he found it in the orchard on the pears, but this year he could not find any. The only explanation that he knew of for its disappearance in the orchard was that the trees had been sprayed with lime-sulphur. It is found that this Blister Mite winters over in the nearly full grown stage. It is such a tiny little animal that it can hardly be seen with the naked eye. Before winter comes on it gets under the scales of the buds where the lime-sulphur wash may reach and destroy it. There is also another remedy that has given good results for the destruction of this pest, viz.: kerosene emulsion. Mr. Caesar did not know how injurious the pest might be, but from the diseased trees which he had seen, it must do a great deal of damage by lessening the power of the tree to supply food for its necessary growth.

Mr. Jarvis: It is interesting to hear that the lime-sulphur wash may destroy this pest. A species of this genus of mite with similar habits attacks perhaps forty or fifty of our forest and shade trees, and if the lime-sulphur will kill them, it will be a good remedy for the Soft Maple mite as well as many others which winter in the leaf buds.

Dr. Felt: The Blister Mite, in some parts of New York state has been very injurious. I noticed one place in particular where some trees were so badly infested by Blister Mites that one could see the brown foliage a quarter of a mile away, and when the foliage is in that condition there is no doubt that the trees are seriously injured. Our experiments go far to show that lime-sulphur or an application of miscible oils or kerosene emulsion in early spring is very effective in controlling the mites.

Respecting the value of the lime-sulphur wash on Maple trees it would depend on whether it would go under the bud scales and thus destroy the mites; he was doubtful whether it would do so.

Mr. Jarvis: I have had no experience with the lime-sulphur on these trees; I only suggested its use, but as Dr. Felt implies the scales of the Maple buds are very compact and perhaps the wash would not get into them so well as it would those that are looser.

Mr. Caesar wished to know whether the wash had ever been applied in the fall instead of the spring with the same good results.

Dr. Felt: I see no reason why the application would not be just as successful. In the case of the San José scale we do not hesitate to recommend the use of the lime-sulphur in the fall; I think the same would be true in the case of mites, but I would much prefer to advise putting it on in the spring. If the operations are delayed a little the buds will be slightly opened and you will secure greater results in that way. The material retains more or less its caustic value for a considerable period and the wash will, therefore, prove destructive to any mites which it reaches.

The Lesser Apple Worm (*Enarmonia prunivora*).

Mr. Jarvis: There is considerable interest being taken in the so-called work of the Lesser Apple Worm this season and I shall ask Mr. Caesar to introduce the subject.

Mr. Caesar exhibited a number of apples that had recently been sent to him from Prince Edward county and from St. Catharines. The senders believed that the injuries were due to some new worm. Mr. Caesar said that all he knew about this pest was what Professor Quaintance had described in his bulletin on the subject but that he was very anxious to get any information that any of the entomologists present could give him. He felt that the injuries on some five or six apples which he picked out corresponded very closely with Prof. Quaintance's descriptions and illustrations. On showing these to Dr. Felt the latter agreed with him that they were probably due to the Lesser Apple Worm. The other injuries Dr. Felt and others thought were not caused by this insect. Mr. Caesar said that if the first class of injury pointed out was due to the Lesser Apple Worm, it would appear that this insect was to be found throughout a large proportion of the best orchards of the province but that it was satisfactory to find that nowhere was it abundant. It was not an entirely new pest because Dr. Fletcher had reported its presence at Toronto, Prince Edward county and Ottawa several years ago. It is also very widely spread throughout British Columbia but Mr. Palmer, one of the Agricultural College students and a son of the Mr. Palmer who has furnished Dr. Fletcher with reports of its progress in the West, states that it is not increasing rapidly in British Columbia.

The life-history of the insect is very similar to that of the Codling Worm but, unlike the latter, instead of boring a hole into the core of the apple it lives near the surface, often causing ugly blotched mines either on the side or at the calyx end. These blotches are often as large as a ten cent piece, or even larger, and disfigure the apple greatly. It is believed that the spraying that controls the Codling Worm will also control the Lesser Apple Worm.

Prof. Lochhead: I have not observed its work at all in the Montreal district. The only reference to it I have had came from Kingston, so I have have had no experience in dealing with it. I do not think it has been reported from Quebec province.

Mr. Jarvis: It is so much like the Codling Worm that we may easily pass it by and not recognize it.

Dr. Felt: I wish to say that I have had no experience with the Lesser Apple Worm. We know, however, that the Codling Worm goes deeper into the apple, so it appears as though the apples exhibited may in some cases have been attacked by this less common pest. The only way, I think, that we can be absolutely certain about it is to find some of the larvæ at work. Although the larva of this insect is very like that of the Codling Moth, yet on careful comparison you can see a difference, particularly, if I remember correctly, at the posterior extremity.

The Apple Maggot (*Rhagoletis pomonella*).

Mr. Jarvis: The Apple Maggot is the larva of a little two-winged fly, and it is reported from a few places in Eastern Ontario. I should like to know if it has spread to any other districts.

Prof. Lochhead: We found the Apple Maggot somewhat abundant in certain districts about Montreal. A few miles up the Ottawa River the Apple Maggot has been abundant for some years in a large commercial orchard and the owner has done everything in his power to control it. Just across the river from Como there is a farm where the Apple Maggot is known to be and we have two careful observers there, upon whose observations I think we can depend. At St. Anne's, five miles from there, I have found the Apple Maggot in some of the old orchards on French farms. I have not observed it on the College trees. Then at Hull, further west, Mr. Reid, Secretary of the Quebec Horticultural Society, reports its presence; and at Covey Hill, near the boundary line between Quebec and New York. I have not seen it there myself. Mr. Swaine was in that district and he confirms Mr. Reid's observations. Then in the City of Montreal one of this College's graduates, who is in charge of the work this year, reports the Apple Maggot as doing serious damage. It is in the barrels in which the apples are packed for shipping. Sometimes he finds it hard to detect. The Apple Maggot, of course, works underneath the skin of the fruit and seldom comes close to the surface. It is difficult to tell when an apple contains one of these maggots. (Fig. 2.)

The only method that we can recommend for its destruction is clean culture and gathering and destroying all the apples that fall. It seems that the Apple Maggot does not leave the apple until full grown. As soon as the apple falls the maggot matures, crawls out and hides at or near the surface of the ground, and there pupates.

Now, it is thought that if hogs or sheep or any common stock are allowed in the orchard to pick up and destroy this fallen fruit the pest would be unable to develop and to pupate. I think that this is probably one of the best methods; but then again we have the point: no matter how careful we are, suppose our neighbors do not take steps for their control, would not the apple flies come over to us from our neighbors? It has been asserted that the flies are not given to the habit of flying from orchard to orchard but confine themselves to the same trees. I do not know how far that can be confirmed.

Going through Prince Edward county six or seven years ago I estimated that from one-third to one-half of the apples were damaged by the Apple Maggot. It does not seem to spread very far out of that particular district. It just seems to locate in certain parts and is not widely spread.

Mr. Gibson: We have had reports from Ontario and Prince Edward counties regarding it this summer.

Mr. Caesar thought the fly did not migrate as a rule. He had found in Prince Edward county a Snow apple tree which had been badly affected by the maggot for three years, while the fruit on the other trees near by of the same variety was untouched. Tolman Sweets were attacked, but Spys and some others in the same orchard were not; Crab apples were also severely injured. It seems on the whole as if the insect preferred the early varieties. The fruit-buyers have now become sufficiently familiar with the pest to refuse to purchase fruit affected by the maggot; such fruit is only fit for the cider mill. Mr. Caesar did not mean to imply that winter apples were not attacked because in other orchards than the one referred to he found

Spy apples very badly affected. While in Prince Edward county he had met one man who had succeeded in almost completely destroying the insects by careful attention to fallen fruit. Hogs had been of great service in accomplishing this result.

Mr. JARVIS: While there is no doubt that the Apple Maggot attacks winter apples, yet my experience has been that it prefers Yellow Harvests to any other variety. I also find it in fall apples.

MALFORMATIONS OF FRUIT DUE TO INSECTS.

Mr. JARVIS: We should, I believe, now discuss another question that has interested us a good deal this year, viz: the cause of malformations of apples and pears. I hope anyone who has had any experience and has studied them will speak out and help in the discussion.

Mr. CAESAR: Here is an apple that was sent in by Mr. Sweny, son of Colonel Sweny, of Toronto, from British Columbia, to find out what was wrong with it. You will notice that there are several strangely elevated areas on its surface suggestive of the boils that rise on a person's body, if I may be allowed to use the comparison. There are also several rather deep depressions. The sender said that whole orchards last year and this year were affected in this way. He said that this year his neighbors had carefully drenched their trees with Bordeaux in the hope of getting free of the trouble. He had used lime-sulphur on his orchard. The result had been that his orchard, with the exception of some of his Duchess trees was very little affected, while his neighbors have had poor results from their spraying. I have very little idea as to what has produced this malformation that you see. Mr. Sweny says: "On Spys, Duchess, Wealthy and Ben Davis, the injury appears chiefly as a hollow, usually turning brown, with a dry brown spot running to the core. On peaches the appearance is the same, but the flesh is not affected." The specimen I have shown you is, he thinks, another form of the same trouble. If he is right in his belief that lime-sulphur has saved many of his apples this year it would, I think, stand to reason that the insect (for there is not much doubt that it is an insect) hibernates in some form on the tree and so is destroyed by contact with the wash. Bordeaux of course would not be expected to give good results against an insect.

There have been a number of pears and a few apples sent to us this year from Brooksdale and Bowmanville, Ontario. These were badly distorted by depressions and elevations. It looks very much as though the trouble is due to the punctures of some insect. When over in the State of New York this autumn I found similarly misshapen apples and asked the entomologist at Geneva what he thought was the cause. He said he had always attributed it to the Plum Curculio. A few days afterwards I showed the same fruit to Prof. Slingerland, who thought that it was not the Curculio but some species of Hemipterous Leaf Bug that had caused the injury.

Dr. Fletcher also thought the injury was due to some Hemipterous insect, possibly a Jassid (Leaf Hopper). I hope some one here has had some experience that will throw further light on this important matter.

No one present had devoted sufficient time to the subject to feel able to give any further suggestions. It was pretty unanimously agreed, however, that the injury was due to some species of insect.

After this specimens of the undoubted work of the Plum Curculio on apples were shown.

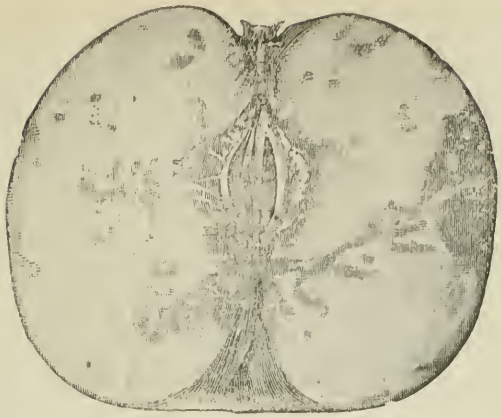

Fig. 2.. Apple affected by Apple Maggot.

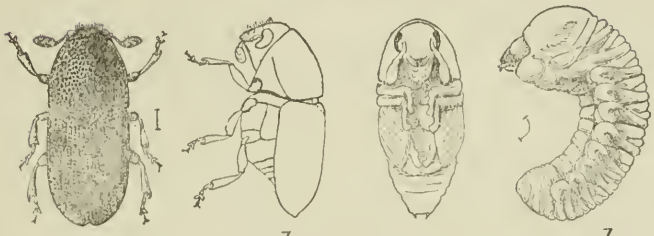

Fig. 3.—*Scolytus rugulosus*: *a*, adult beetle; *b*, same in profile; *c*, pupa; *d*, larva—all magnified about 10 times. (U. S. Dep't. of Agriculture).

Fig. 4.—Work of *Scolytus rugulosus* in twig of apple—natural size. (U. S. Dep't. of Agriculture).

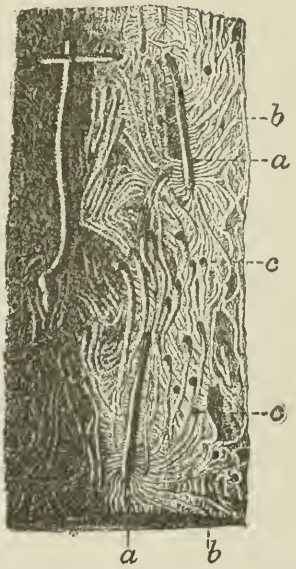

Fig. 5—Galleries of *Scolytus rugulosus* on twig under bark; *a*, *a*, main galleries; *b*, *b*, side or larval galleries; *c*, *c*, pupal cells—natural size—(after Ratzeburg, from U. S. Dep't. of Agriculture).

THE SHOT-HOLE BORER (*Scolytus rugulosus*).

Mr. JARVIS: The Shot-hole Borer or Engraver-beetle has been doing considerable injury, or at least we think it has been doing so, during the past two or three years. At one time it was thought that the borer only worked on decaying wood or on unhealthy trees, but some of our fruit-growers are beginning to think that they cause the death of the tree. We would like to hear from any of the members who have had any experience with this beetle.

Mr. CAESAR: The Shot-hole Borer was brought up and discussed last year at the annual meeting of the Entomological Society. We had hoped that its ravages would be checked by this year, but it has been so destructive this spring and fall that it is necessary, in justice to the Society, I think, and in justice to those who are interested in the work of the Society, that it should be brought to the attention of the members.

When I was down near St. Catharines on the 10th of June examining a fungus disease that was attacking the peach trees, Mr. McCalla—one of our best and most scientific fruit-growers,—asked me to come and look at his cherry trees. He had fifteen fine sour cherry trees apparently flourishing so far as the foliage showed at that time. but every branch up to half an inch in diameter was practically covered with exudations of gum. There were thousands of exudations on the trunks and all over the trees. Of course a tree cannot stand that sort of thing very long. On removing the gum with a knife one could see a little round hole quite clearly. A black beetle about a quarter of an inch in length was causing the trouble. Last year I found in about ten different districts perfectly healthy trees, both sour and sweet cherry, attacked by this same Shot-hole Borer, (*Scolytus rugulosus*). Figs. 3, 4, and 5.

Not more than two weeks ago a man near Grimsby, to whom I had recommended a method of treatment last year, wrote me that he had again this fall millions of these beetles. "I believe," he said, "it is the most difficult pest there is in the Province to combat. I have already this fall removed sixty of my cherry trees out of three hundred. I have taken out twenty loads of branches in addition and I am afraid I am going to lose every cherry tree I have got."

Just the other day I had a letter from Mr. Beattie, of St. Catharines, stating that his peach trees were being severely attacked. I have often seen a peach tree here and there throughout the district attacked but the sweet and sour cherry trees are by far the most commonly assailed, occasionally plum trees are rather badly attacked.

Dr. FELT: You have found that they attack the healthy cherry trees as well as diseased ones?

Mr. CAESAR: Yes, the fifteen cherry trees belonging to Mr. McCalla gave every appearance of being perfectly healthy when attacked. Many of the trees I found attacked last autumn were also healthy ones.

Dr. FELT: Is it not probable that there is a great deal of dying wood in that district?

Mr. CAESAR: There is a great deal of it. I am afraid that unless old orchards that have been killed by San José scale or trees that have died from other causes are cut down and burned, these may afford such excellent breeding grounds for the beetles that the fruit-growers may lose very seriously from the attacks of great numbers of them on healthy trees. The beetles certainly are increasing at an alarming rate.

My observations this year and last year lead me to believe that there are two periods in the year when they are specially destructive: First, in May, continuing on for some time into June; second, in August, continuing on through September. I might say that in no case hitherto have I been able to find either eggs or larvæ under a gum mass on a healthy tree; so that it would seem perfectly possible in many instances to save healthy trees even after they are attacked. If there were eggs or larvæ under the gum masses this would be impossible.

The treatment recommended last autumn in a circular letter to the press of the district was to cut down and *burn* before the warm days of the spring all dead and dying trees, and also any trees so badly weakened that there was small hope of their recovery. In addition, dead or badly attacked branches were to be pruned off and burned. This was to be followed by the thorough spraying of all the remaining trees with lime-sulphur in the spring. This was done in several orchards and no further trouble was found, or in those orchards where spring applications of an oil wash had been made. This is not sufficient, however, to prove that lime-sulphur or an oil wash, such as Carlson's Mixture, was the real cause of the absence of the beetles, though it looks as though such was the case. For the August attacks it seems probable that lime-sulphur or a lime and soap wash with a little carbolic acid in it would be very useful as a means of warding off the beetles.

Prof. Lochhead: I remember that some years ago when dealing with the San José scale this Shot-hole Borer was very abundant in some districts where the scale had already killed the trees. I have always believed that the Borer attacked trees that were a little off-color or something wrong with their roots, and so not completely healthy. I do not see exactly why the borers should limit themselves to diseased trees; still it seems to be their natural habit to go to such trees.

Mr. Jarvis: I know of three peach trees in sod in the Grimsby district which are badly attacked by this beetle; close by there are other trees where the soil is cultivated, which show no evidence of this pest.

Dr. Felt: I have watched these insects for some years and know that generally speaking they do attack weakened or diseased trees. I believe, however, that they do, as mentioned this afternoon, sometimes attack perfectly healthy trees. The real source of the trouble in such cases is not necessarily due to their breeding in the immediate neighborhood. Dr. Hopkins has recorded flights of the beetles evidently coming from a considerable distance and I believe that they fly in more or less large swarms. My impression is that the beetles that have attacked the healthy trees referred to have probably come in swarms of greater of less extent. I think the only practical solution of the difficulty is to get the fruit-growers interested and remove all the dead material. Then let them, as suggested, put on their lime-sulphur. If it does not ward off the beetles it will at least pay for itself by warding off fungus diseases.

In answer to the question whether he agreed with the statement that there were apparently two main times in the season that attacks were to be feared, Dr. Felt said he believed the statement was correct so far as he knew.

Aphids.

Mr. Jarvis: The cabbage Aphids have been increasing year after year now for several years. We get a great many letters asking for remedies. We find it very difficult to get any really satisfactory remedy that seems practicable.

Mr. Caesar said he was afraid that no remedy could possibly ward off attacks because he thought that winged females flew from plot to plot and rendered all remedies more or less futile.

Mr. Bethune: I think that it is the long continued dry weather that has allowed the Aphids to become so very numerous and destructive this year. It is very difficult to suggest a remedy to a farmer who is growing turnips by the acre, because he will not apply a troublesome spray, and what I recommend them all to do is to be on the lookout when they are hoeing the crop and trample underfoot any affected foliage. Some farmers said that their crops were entirely destroyed, while others said that the turnips were all right though the foliage was very badly affected.

Another insect which has been serious in a great many places is the Turnip Maggot, similar to the Cabbage Maggot. These insects cause the turnips to be all distorted and with woody or rotten spots. They are then useless for any purpose as the cattle will not eat them and they are of no use in any other way. I do not know any remedy that is really practicable for dealing with this insect.

The Bag Worm.

Mr. Jarvis: I wish to call your attention to another insect that was found by Raymond Zavitz, of Guelph, this year, the Bag Worm. It was found on a cherry tree. I think it has been found here for the first time. I would like to hear what Dr. Felt says about this pest. We have it here this year and it is probably the first time that it has been reported in the Province. I saw a note about its being found in New York State.

Dr. Felt: The Bag Worm is in New York State, rather commonly about New York City, and I should say off and on ranging rather abundantly for thirty miles around. This last summer I was rather surprised to receive the Bag Worm from Red Cedar, forty miles south of Albany. I think it is an unusual record for New York State and just why you should find the insect here I do not understand, because this must be equivalent to about fifty miles further north than the latitude of Albany, and perhaps the weather is a little more extreme in winter.

Dr. Bethune: I had a specimen of the moth given to me two years ago, which was taken in this part of Ontario and I thought it was extremely remarkable. I never heard of the Bag Worms in Ontario before. Here in Guelph we are just on the verge of the upper Austral and the Canadian Boreal zones and we get a little of the fauna and flora of both zones, so that we find a few insects reach us here that hardly extend further north or south, as the case may be, and it seems we are free from most of the southern species which are troublesome along the shores of Lake Erie. This insect certainly is remarkable for having come to such a point as this.

As far as these zones are concerned I suppose we are rather more than fifty miles further north than Albany. It is never safe to say where the line between these zones should be drawn.

We find many things growing quite luxuriantly about Dundas and in the vicinity of Hamilton, which will not grow here at all. We are, I think, about 1,100 feet above the level of the sea and are more than twice as high above Lake Ontario as the Hamilton Mountain, so that there is a difference in altitude as well.

After some further informal discussion on a variety of injurious insects. the meeeting adjourned.

EVENING SESSION—THURSDAY, NOVEMBER 5TH, 1908.

A public meeting was held in the Massey Hall building of the Ontario Agricultural College, and was largely attended by members of the Society, students of the College and Macdonald Institute and visitors from the city. The chair was taken by Dr. Bethune, Professor of Entomology. The proceedings were very much enlivened by musical selections excellently rendered by the College Orchestra.

The chairman, in his opening remarks, referred in feeling terms to the great regret that was felt by all at the absence of their President, Dr. James Fletcher, who was seriously ill in a hospital at Montreal. Being the forty-fifth annual meeting of the Society, of which he, the chairman, was one of the founders, he gave a short account of the history of the Society and of the good work which it has accomplished during all these years. He then introduced, as the chief speaker of the evening, Dr. E. P. Felt, of Albany, the State Entomologist of New York, who was widely known from the numerous books and papers on economic and systematic entomology that he had published; though still a young man he had attained a high reputation due to the excellence and thoroughness of his work. Dr. Felt then gave the following lecture on "The Interpretation of Nature," which was illustrated with a large number of beautiful and interesting lantern slides.

THE INTERPRETATION OF NATURE.

By E. P. Felt, Albany, N.Y.

Our civilization is based on the accumulated wisdom of the ages. The ancient lore of the Chinese, the mystery of the Hindoo, and the culture of the Greek, all have had an important influence upon the development of the human race. The learned man acknowledges his debt to these and other sources of wisdom. None take issue with Pope when he writes: "The proper study of mankind is man." We would go farther and say: The proper study of mankind is man, the earth and the fulness thereof. Even as ignorance of the wisdom of the ancients restricts the usefulness and activity of the individual, so does a failure to understand the laws governing the existence of other forms of life, circumscribe the power of dominant man. In other words, the welfare of man is most closely bound up with that of a number of animals and plants. Detailed knowledge of these latter is essential to continued progress. One can not be separated from the other.

Nature is kind to the student of economic entomology, since she gives him five or six opportunities to identify an insect, namely, the egg, larva, pupa, adult and work. This kindness is not always so apparent, especially when it is remembered that this abundance and variety of form means a corresponding increase in the number of characters to be memorized, particularly as an entomological constituency frequently expects identification in all stages. The story is easy to decipher if the page has been previously studied, otherwise its translation may be as difficult as that of the Egyptian hieroglyphics. Not infrequently neither the egg, larva, pupa, adult, work or debris is at hand, and the entomologist may be called upon to separate fact from poor or absolutely misleading descriptions. In the latter event, it not infrequently happens that an intimate knowledge of local conditions is of vast service in reaching a satisfactory conclusion.

The work of the economic entomologist only begins with the identification of the insect. This step is simply a means to an end. Now, he is called upon to exercise his proper function as an interpreter and to render an opinion as to the nature of the insect. His prognostication depends upon several factors, the most important of which is a knowledge of the insect and its previous history in the locality under consideration. This is of much service in the case of well known insects but of comparatively little value when an unusual outbreak occurs. Then he must fall back upon his knowledge of the general habits of the group, supplemented in not a few instances by an understanding of the local conditions. Furthermore, he must take into consideration the influence of climate and the likelihood of parasites being abundant enough to check an outbreak in its incipiency. Recommendation naturally follows prognostication and is determined in large measure by the previous findings. It frequently happens that, owing to the nature of the crop infested or the character of the outbreak, direct control measures are impossible. An intimate knowledge of the possibilities may result in a different rotation of crops being advised or modifications in culture. The wisdom of applying direct insecticides, such as the internal poisons or those destroying by contact can be determined only by a variety of conditions. We must take into account the time of year, the condition of the crop, particularly if it be fruit, and the recommendations may not only vary from year to year but be widely diverse in different seasons of the same year.

The Bark Borers are extremely interesting forms and we propose to discuss a number of species very briefly because of the most admirable records they give concerning the identity of the form responsible for the mischief, the time when the injury was inflicted, the sequence of the species working in the bark and a variety of interesting biological data, all of which may be gleaned by a study of their workings.

The small, pale, yellowish, gummy exudations on the limbs of peach trees are very suggestive of the Fruit-tree Bark-beetle (*Eccoptogaster rugulosus*, Ratz.). It is only necessary to make an examination and find the circular exit holes or to disclose the characteristic galleries lying beneath the bark, in order to confirm our suspicions. The early work of this insect is very beautiful, showing the longitudinal gallery made by a single female and the numerous, more slender larval tunnels, the latter increasing in size with their length and ending in a pupal cell. This species is occasionally so abundant in New York State as to literally destroy the inner bark and thickly score the sapwood. This illustration shows such a condition and also represents the work of a wood-pecker. This bird not only removes the outer bark in its search for the grubs and pupæ, but frequently splinters the wood in its eagerness to secure such delicacies. The Hickory Bark-borer (*Scolytus quadrispinosus*, Say) is related to the preceding and has a very similar method of operation. The female enters at one point, continues her gallery with the grain of the wood, depositing eggs on either side. The larval galleries diverge therefrom as in the preceding species. It is comparatively easy to estimate the prolificacy of an individual by counting the larval burrows originating from the tunnel of a female. This species is occasionally very injurious to hickories in New York State. The Red Cedar Bark-beetle (*Phloeosinus dentatus*, Say), though rarely abundant enough to cause material injury, is extremely interesting because of the beautiful and very characteristic galleries it makes in its food plant. There is almost invariably a three-lobed chamber at the point of entry, while the long, slender larval tunnels, just grazing the white wood, present a strong contrast to the dark brown bark delimiting their margins. Most interesting of

all, we occasionally find a piece of fossilized wood engraved by one of these borers. We have before us an illustration representing a piece of arbor vitæ from the interglacial beds in the vicinity of Toronto, and the carvings, though faint, tell interesting stories of early life on this continent. The form of these galleries is so characteristic that Dr. Hopkins, our American authority on this group, referred the maker (*Phloesinus squalidens*, Scudd.) to a genus and on account of the restricted food habits of its allies, gave a provisional determination of its food plant. The Ash Bark-beetle (*Hylesinus aculeatus*, Say) presents another type, since the adult galleries diverge from a common point, indicating, as we are told, that two females are probably responsible for their construction. The borings are beautiful in their regularity.

Some of these insects are very injurious to our forest trees, and a study of their habits has therefore a practical, as well as a scientific value. It is interesting to note what can be learned from a large pine tree which has evidently been dead some years. The bark may have largely disappeared, as in the case illustrated, but a close examination of the lower portion of the trunk shows that the sapwood has been badly scored by some borer, and a little familiarity with the habits of these insects would enable us to name the offender. Before attempting this, let us look at the condition of two pines as they were in September. One is apparently in excellent condition while the top of the other has perished. The needles of both, though not shown in the illustration, were decidedly unhealthy and by the following spring the trees were bare and the bark had begun to peel. An examination of the lower portion of the trunk shows a number of pitch tubes, indicating clearly that certain bark beetles had been at work before life was extinct. A pitch tube is nothing more than particles of pitch carried by the insects from their burrows and laid around the mouth of the exit. The insect responsible for this work is known as the coarse writing bark beetle (*Tomicus calligraphus*, Germ.), a species which makes a very characteristic series of galleries and confines its operations almost exclusively to the thicker bark of the lower portion of large trees. Occasionally a dead tree may be found standing and give little external evidence as to the cause of injury. A closer examination may result in finding circular exit holes here and there upon the bark. These invariably mean that insects have been at work beneath. The removal of a large piece of bark may reveal a confused mass of galleries frequently nearly filled by borings and decaying particles of bark. Apparently there is little of significance, but on brushing away the debris, we sometimes find a few galleries preserved by infiltrated pitch, incontrovertible evidence that the pine was attacked while alive. The tree, in making an effort to recuperate from the injury, exudes pitch. This latter infiltrates the walls of the galleries and thus a record of injury may be preserved for years. The bark borer is followed in turn by certain species which live upon the dead inner bark, and in some instances also upon dying wood. One of the most characteristic of these is *Rhagium lineatum*, Oliv., a species which produces, between the bark and the wood, very characteristic pupal cells, the walls of the latter being composed largely of white fibres torn from the sapwood. *Pytho americanus*, Kirby, is an ally of the same and, like its associate, constructs between the bark and the wood a distinctive pupal cell, the walls of the latter being composed entirely of almost rotten bark borings. The two last named species may also be found in association with Monohammus, the larvæ of which are perhaps better known as sawyers. The exit holes of Monohammus are large, irregular, not sharply defined. The galleries made by the larvæ are easily recognized, since they are broad, irregular, traverse

both bark and wood, occasionally entering the latter to a considerable depth, and are invariably accompanied by coarse, sawdust like borings.

The coarse writing bark beetle mentioned above is usually hardly more than an assistant to the pine bark beetle (*Tomicus pini*, Say). This latter is a smaller form and confines its operations to the thinner bark of the middle of the tree and on the larger branches. Its galleries, like that of its associate working below, are very characteristic and, in some instances, extremely beautiful. Not infrequently this insect breeds in such large numbers that the bark is fairly dotted with its exit holes, while the tissues beneath are riddled by numerous galleries of both adults and larvæ, not to mention the borings of young Monohammus larvæ, frequently found in these situations. Later, Rhagium and Pytho may occur, though as a rule, not so abundantly as under the thicker bark at the base of the tree.

The Balsam Bark-borer (*Tomicus balsameus*, Lec.) is another extremely interesting species. It is occasionally quite injurious to its food plant. The early work begins with an irregular central chamber with two or more transverse adult galleries, the larval burrows being usually with the grain of the wood. This insect breeds throughout the length of the tree and occasionally a group of adults, starting from one central chamber, may entirely girdle a young twig, though this method of work is somewhat exceptional. Three transverse galleries originating from a central chamber is somewhat typical of this insect's work. The plan of operation is frequently obscured in a badly infested tree by interlacing of the galleries and the development of fungus in the decaying tissues. Under these conditions, the only evidence we know of to show that the tree was attacked while alive is the occurrence, in small chambers here and there, of masses of dried balsam. These accumulations usually result from balsam flowing into cavities from injured living tissue.

It will be seen from the preceding that much can be learned from comparatively obscure signs when one understands their significance. The galleries of various bark borers are so characteristic as to permit of the ready identification of most species, and in not a few instances the determination of the plant affected. Furthermore, the condition of the tree at the time of attack can be determined with a considerable degree of confidence and the sequence of the species ascertained. The same is true of insect work in many other groups though it is not always so susceptible of proof. Many times the signs have little or no significance because we fail to comprehend their import.

Records of insect work are sometimes made under other than natural conditions. Certain species invade the house, and, unfortunately, many of us are too familiar with signs of their presence. Occasionally, as in the instance under consideration, the insect is the sufferer. This particular case is of special interest, since it is practically an artificial fossil, a large June beetle (*Lachnosterna*) having been literally crushed into the paper during the process of calendaring. Note the preservation of the antennæ and legs, suggestive of what might be done along this line with other species. Incidentally, we wish to call attention to the melancholy fact that a few individuals, insect as well as human, attain notoriety only when they make an exit from this world in an unusual manner.

Turning now to some forms which are of great interest to residents of cities and villages, allow me to give you a little idea of their importance in an adjacent State. The work of the White Marked Tussock Moth (*Hemerocampa leucostigma*, Sm. & Abb.) is so well known that we unconsciously associate defoliated horsechestnut trees with the presence of this

insect. It has been very destructive in recent years in many cities, and villages of New York, particularly at Buffalo. Furthermore, judging from accounts which have come to our attention, certain Canadian cities have not been altogether free from the ravages of this beautiful caterpillar. The wingless female is probably well known to most who are at all interested in preserving our shade trees, while the characteristic white egg masses need no description at the present time. The control of this insect is easily affected, either by collecting egg masses or thorough spraying with an arsenical poison at the time the young caterpillars begin operations. The selection of one method to the exclusion of the other must be governed largely by local conditions.

The Elm-Leaf Beetle (*Galerucella luteola*, Mull.) is another species which has been very injurious to elms for over a decade in the Hudson valley. It has recently become quite destructive at Ithaca, N.Y., and will presumably inflict considerable injury upon elms in other cities in the western portion of the State. Saratoga Springs and its vicinity seems to be the northernmost limit in New York State where serious injury is likely to occur. It displays a marked preference for the English and Scotch elms and, under certain conditions, may become injurious to the American elm. The larvæ feed exclusively on the lower surface, leaving the tough upper epidermis unbroken. The leaves are skeletonized, only the mid and lateral ribs, supported by a thin, brown membrane, remaining. This habit of the larva makes it imperative to apply the arsenical poison to the under surface of the leaves.

The Snow-white Linden Moth (*Ennomos subsignarius*, Hubn.) attracted a great amount of attention, because the delicate, snow-white moths appeared in myriads about the electric lights of New York City, various other localities in the Hudson valley north to Saratoga and along the Mohawk valley westward to Utica. Reports of similar flights also came from northern New Jersey, from Springfield, Mass., and Ottawa, Canada. This species has not, in recent years at least, attracted notice on account of injuries to shade trees, and even during the past summer there was no marked damage by the caterpillars of this insect to street trees. There were, however, serious outbreaks by this species in both the Adirondacks and the Catskills, the injuries in the latter locality having been preceded by extensive defoliation the preceding year. The light brown, barrel-shaped eggs of this insect are deposited in clusters upon the bark, and a search for them should give some idea as to the probability of the injuries being repeated another season.

The Sugar-Maple Borer (*Plagionotus speciosus*, Say) is rarely seen, though its operations upon sugar maples are very evident in many localities throughout New York State. The initial injury is usually marked by an oblique elevation on the trunk or near the base of the lower branches. This overlies the gallery of the grub and is caused by the abundant formation of new tissues along the line of injury and the consequent pushing up of the old bark. The latter, in case of a bad injury, eventually cracks, exposes the wood, and after a series of years, owing to the deficient circulation, both above and below the oblique part of the wound, the bark dies back till we have a large bare space, usually accompanied by the death of the limbs on that side of the tree. The exposed tissues decay and eventually wind and storm bring about the destruction of magnificent trees. This insect may be regarded as one of the most serious enemies of maples in New York State, though its work is conducted in a very unobtrusive manner.

The Gipsy Moth (*Porthetria dispar*, Linn.) should be mentioned in this connection, though it has not yet been found in New York State. It has

become established in two Massachusetts localities within fifty miles of our line. The control of this insect is of great interest to all States liable to become infested. It would be a rash individual who would dare to say that any locality in the Northeastern United States or in a territory adjacent to the north might not be invaded by this insect within a decade. Defoliated woodlands are characteristic of a bad infestation by this species. The caterpillars not infrequently become so abundant as to form large clusters at the base of trees, sometimes fairly covering the trunks as they range themselves side by side. The caterpillar itself is an inch and a half to two inches long, hairy, dark grayish, with a double row of warts down the middle of the back, the ten anterior blue, the twelve posterior red. The insect is also easily recognized by the heavy bodied, dingy white female lightly and irregularly streaked with black and gray, in connection with the conspicuous yellowish or buff colored, oval egg masses about an inch in diameter and appearing much like a section of a sponge.

The Brown Tail Moth (*Euproctis chrysorrhœa*, Linn.) though a more recent introduction, has become much more widely disseminated than the preceding. It has not yet become established in New York State, though it occurs in Nova Scotia. The winter nests of this species are very familiar, while the snow white, brown-tailed moths and the orange brown caterpillars, with a conspicuous row of white spots on either side and two bright red spots near the posterior extremity, are easily recognized. This insect is not nearly so injurious in Massachusetts as the Gipsy Moth.

The control of these two introduced species is of great importance to all residing in territory likely to become infested, since the more thoroughly the inscet is kept in check, the less chance there is of its becoming established in new territory. Massachusetts authorities are using thoroughly up-to-date power spray apparatus for the application of arsenical poisons to shade and forest treees. Recent improvements have resulted in greatly increasing the capacity of the ordinary spraying outfit by replacing the usual six horse power gasolene engine, weighing some 1,800 pounds, by a ten horse power engine made especially for automobiles and weighing only 400 pounds. Furthermore, a heavier and more powerful pump has been employed, the whole weighing no more than the usual spray outfit. The machinery is mounted upon a stout wagon with a 400 gallon tank, and a heavy inch and a half hose some 400 to 800 feet long, with a smooth quarter-inch nozzle, is employed. A pressure of 200 to 250 pounds is maintained. The hose is handled much as though a fire was in progress. Ten men, at intervals of six or eight feet, carry the end of the hose, the nozzle being in charge of a superior man, with instructions to keep it moving all the time. The pressure is sufficient to throw the insecticide 40 or 50 feet and the resistance of the air breaks it into a fine spray. The foliage is well covered if the nozzle is handled intelligently. This giant outfit is particularly adapted to work in woodlands. It usually requires four horses and is capable of spraying 14 to 16 acres a day, much depending upon conditions. The cost of treatment in this manner is reduced to about $10.20 per acre where the woodland is fairly clear of underbrush. An interesting modification of this apparatus has been employed for spraying strips along the road side, and it could probably be used, under some conditions at least, upon shade trees. It simply consists of a giant extension nozzle mounted on a universal joint so that the tip may be lifted 40 or 50 feet from the ground. This last named apparatus, with a favorable wind, can cover a strip 400 feet wide.

The work with parasites of the Gipsy and Brown Tail Moths, conducted by the State of Massachusetts in co-operation with the Federal Gov-

ernment, is most encouraging. The work of 1907 has been considerably extended in providing larger quarters and a more adequate staff. Furthermore, efforts have been made to secure larger sendings from European countries, and a special agent was dispatched to Japan. This latter undertaking has proved most encouraging, in that a large Apanteles and a new egg parasite of the Gipsy Moth have been received from Japan. The Apanteles has been bred through one generation in American caterpillars. The sendings from Japan have, in addition, resulted in the introduction of four species of Tachinidæ which promise to be very efficient parasites of the Brown Tail Moth. Marked improvements have been made in methods of handling and rearing parasites and other natural enemies. This latter justifies the expectation that it would be practical to breed thousands of the more effective species prior to their being liberated under favorable conditions. This work with the parasites may rightly be considered as most important, owing to the fact that the Gipsy Moth is now so widely established as to render any widespread method of control, aside from that with natural enemies, exceedingly costly.

There are several fruit tree insects worthy of mention in this connection, though most of them are so well known that comparatively little that is new can be given. The Codling Moth (*Carpocapsa pomonella*, Linn.) lays heavy tribute upon our fruit growers, causing an annual loss on the apple and pear crop of New York State estimated at $3,000,000. The operations of the Apple Worm are too familiar to require description, and the same is true of the characteristic pupal cells found under the bark. The parent insect is less frequently seen and the transparent, whitish egg, sometimes deposited upon the fruit and frequently upon the leaf, practically escapes observation. Our fruit growers rely almost entirely on thorough spraying with an arsenical poison, making the application when the green sepals are still open. Arsenate of lead, in the experience of one pear grower at least, has proved much more effective than other poisons in controlling this insect upon that fruit.

The Cigar Case-bearer (*Coleophora Fletcherella*, Fern.) has caused much injury to fruit trees in some sections of Western New York. This species appears to be much more destructive in that region than in the Hudson valley. The brown, cigar-like cases are about one-quarter of an inch long and easily recognized by their characteristic form. The young caterpillar, as is well known, eats a little hole into the leaf and then devours the more tender parenchyma lying between the upper and lower epidermis. This habit renders its control somewhat difficult, though an early application of a poison at the time the leaves begin to appear has proved very effective.

The Blister Mite (*Eriophyes pyri*, Nal.) has been unusually destructive in certain orchards in Western New York and its presence has also been noticed in the Hudson valley. The work of this species is quite characteristic though it presents a somewhat superficial resemblance to that of the case bearer mentioned above. The blisters caused by the mite are invariably raised, somewhat thickened, and there is a small, irregular, circular hole near the center of the blister. The venation also disappears in the affected area. These characters serve to separate its work from that of the case bearer mentioned above, while the thickening of the tissues at once differentiates it from fungous attack. Spraying in early spring with either a lime-sulphur wash or a whale oil soap solution has proved effective in controlling this species. The advisability of making such an application must be determined largely by the abundance of the mite.

Several scale insects are more or less common in New York State orchards. An old and common enemy is the Oyster Scale (*Lepidosaphes ulmi*, Linn.), a species which is sometimes quite abundant upon young fruit trees and is especially likely to be numerous on ash. It is easily controlled by thorough applications of either a whale oil soap solution or a kerosene emulsion, the latter part of May or early in June at the time the yellowish young are most abundant. The Scurfy Scale (*Chionaspis furfura*, Fitch) is another old enemy, which in recent years has proved somewhat more destructive than the Oyster Scale mentioned above. It can be controlled in the same way. The San José Scale (*Aspidiotus perniciosus*, Comst.) has become well established in a number of sections in New York State and our more progressive growers are quite confident of their ability to keep the insect in check. Early spring applications of a lime-sulphur wash, or a miscible or so-called "soluble" oil are the two methods most extensively employed. We think it safe to say that by far the most of our fruit growers rely upon some preparation of a lime-sulphur wash and, as a rule, obtain very satisfactory results. The application is generally made in the spring, the more thorough growers making a practice of giving two sprayings, with the wind in opposite directions, whenever possible.

In conclusion, we wish to call attention to one of the most important of economic insects. The welfare of our forests, the preservation of our shade trees and the production of large quantities of farm produce, while valuable and in may ways essential to happiness, is of no avail if life be in danger by reason of neglect of ordinary sanitary precautions. The ubiquitous House-fly, tolerated for ages and assumedly an inevitable nuisance (not to use a stronger word) has come to be regarded as one of our most important economic insects. This change in attitude is due to the recent discovery that, under certain conditions at least, the House-fly may be an important factor in the distribution of typhoid fever and the germs responsible for certain other grave intestinal disorders. It is stated that there are 350,000 cases of typhoid fever annually in the United States, about 35,000 proving fatal. Recent investigations in the City of New York, conducted under the auspices of the Merchants' Association, show a remarkably close parallelism between the abundance of flies and the occurrence of typhoid fever and related infections. It is not necessary at this time to give full details respecting this insect. The House-fly is a child of filth with inherited tastes perverted beyond the possibility of reclamation. Furthermore, its breeding places are comparatively restricted. It is entirely within practicability to reduce its numbers to an almost negligible quantity He who is indifferent to this insect and its possibilities might well dance on the edge of a crumbling cliff overhanging a deep chasm inhabited by one of the most hideous forms of death. This is strong language. The situation justifies it. The suffering of a typhoid patient and the heavy pall of grief falling upon the afflicted family, cannot be adequately depicted by words. The true relation of the House-fly to the welfare of man must be known. This bearer of malignant germs should be excluded from our homes and a campaign begun which should eventually result in the practical eradication of this insect from the haunts of man.

ENTOMOLOGY IN THE GRADUATE SCHOOL OF AGRICULTURE, CORNELL UNIVERSITY, JULY 6-31, 1908.

By Wm. Lochhead, Macdonald College, P.Q.

It was somehow or other unconsciously taken for granted by all students of insect life that Entomology would form one of the parallel courses offered during the summer session of the Graduate School at Cornell University. To have a School of Agriculture at Cornell without Entomology was hardly possible, even thinkable, for did not four-fifths of all the Experiment Station workers and teachers in Entomology in agricultural colleges receive their inspiration and early training from Professor Comstock and his able staff of co-workers? So it came about naturally that Entomology was placed on the programme of courses, as soon as it was decided that the Graduate School would be held in 1908 at Cornell.

The task of arranging for speakers, topics and dates fell mainly on Prof. Slingerland, who also acted as chairman of each meeting. It was finally decided to have a lecture every morning (except Saturday and Sunday) from 9.30-10.30, and seminars on Tuesday and Thursday afternoons from 3 to 5. By this schedule, the horticulturists at the School were free to attend, and to benefit by the course. This arrangement was welcomed, and many of them attended every lecture.

The first week was assigned to the experts of the Bureau of Entomology at Washington. Dr. Howard gave two lectures on (1) "The Present Condition of Economic Entomology," and (2) "Recent Developments in the Practical Handling of Beneficial Parasitic Insects." Prof. A. L. Quaintance discussed the deciduous fruit investigations of the Bureau of Entomology, and led a large field party in a study of Mr. King's extensive orchards at Trumansburg. Prof. A. H. Hopkins gave one lecture on "The Work of the Bureau of Entomology Against Forest Insects," and conducted a field trip for the study of the common insects infesting trees in the vicinity of Cornell. Prof. F. M. Webster concluded the lectures of the first week by an account of the investigations of insects injurious to grain and forage crops by the Bureau of Entomology.

The second week was assigned to some of the most important Station Entomologists. Prof. P. J. Parrott of the N. Y. Agricultural Experiment Station, Geneva, gave two lectures on methods in planning and conducting co-operative experiments which were very suggestive and helpful. His seminar was devoted to a study of problems which were interesting him at the present time, viz., the pits on apple twigs and branches, made by the tree-cricket; the pits and markings on pear fruit by membracids; the leaf blister-mite in apple orchards; the willow girdler.

Prof. Slingerland described the work of an interesting plum leaf miner (*Nepticula*), and the work of Heterocordalis malinus, a bright red bug which distorts the leaves and fruit of the apple, preferably Greening and Ben Davis varieties.

Mr. Crosby described a new chalcid (*Syntomaspis druparum*) which he found infesting apple seeds.

Prof. E. D. Sanderson, Director of the Vermont Experiment Station, gave two lectures, one on the publications of the State Entomologist, and the other on methods of studying the Codling Moth, and conducted a seminar on the Codling Moth. The work of Prof. Sanderson was highly appreciated by all who took part.

Dr. E. P. Felt, New York State Entomologist at Albany, gave a lecture on the "Work and Systems in the Office of the State Entomologist," giving

particular attention to the methods he adopted in indexing and cataloguing insects, experiments, and correspondence.

The third week was assigned to Dr. Forbes and Dr. Folsom of Illinois. The former in his first lecture discussed the scope of economic entomology, and emphasized the importance of the ecological phase. The Economic Entomologist should study both plant and insect ecology on account of their mutual bearings, and should keep continually before him the humanistic aspect; that is, the value of his results is to be interpreted by their ultimate good to man. Dr. Forbes' second lecture dealt with concrete examples of economic studies, which he himself had made in Illinois, viz., the Northern and the Southern corn-root-worms, the common white grubs, and the aphids of the corn plant. In the period allotted for a seminar, Dr. Forbes described his method of keeping his office records. He keeps (1) an Accession Catalogue, (2) A Species Catalogue, and (3) An Experiment Record. Dr. Folsom gave three most interesting and instructive lectures on the "Insects Injurious to the Clover Plant," and conducted a trip for the study and collection of these insects in the fields. He dealt with the following: *Clover-leaf weevil, Pea aphis, Clover-stem borer, Clover-seed Midge, Clover-seed Chalcid, Clover-seed Caterpillar, Clover-root Borer* and *Clover-hay worm.* A monograph on clover insects will be published soon by Dr. Folsom, who has devoted nearly five years to this subject.

The fourth week was assigned to the Entomological Staff of Cornell University. Prof. Slingerland devoted two lectures to insect photography, to which he has given much attention, so that he is now considered our foremost insect photographer.

Dr. J. G. Needham gave a lecture on "What Shall be Done with the Marshes?" He pointed out that while many marshes should be drained and made valuable as agricultural lands, there are other marshes that should not be drained, as they serve useful purposes, and on account of their location would never be valuable as farm lands. He urged that such areas be made places of beauty and recreation, free from the festive mosquito. Dr. Needham conducted the class to his Marsh Laboratory near Renwick Park and explained the nature of the investigations he was conducting with aquatic forms.

Drs. MacGillivray and Riley gave interesting lectures on the "Methods and Aids in Entomological Instruction." They urged the importance of careful systematic work, not only along the older lines of anatomical and systematic Entomology, but also along the newer lines of morphological and embryological investigations, if many of the problems that are now confronting the economic entomologists are to be solved successfully.

Much credit is due Prof. Slingerland for the excellent course of lectures provided, which every member of the class thoroughly enjoyed.

From the old Cornell students in attendance, the absence of Prof. and Mrs. Comstock—who were taking a well-earned holiday in Egypt and Europe—called forth many expressions of regret, for to most of them the most pleasant memories of their Cornell life are associated with Prof. and Mrs. Comstock in the Entomological Laboratories.

At the close of the proceedings a hearty vote of thanks to Dr. Felt was proposed by Prof. Lochhead, seconded by the Rev. Dr. Fyles, of Quebec, and enthusiastically adopted by the meeting. After a musical selection by the orchestra, the audience joined in singing "God save the King," and the session was brought to a close.

SECOND DAY'S SESSION—FRIDAY, NOVEMBER 6TH, 1908.

The Vice-President, Mr. Tennyson D. Jarvis, took the chair at 9.30 o'clock a.m. in the Biological lecture-room of the Ontario Agricultural College. There was a good attendance throughout the day, composed of students as well as members of the Society. The first order of the day was the reading of the reports of the Council, the Branches of the Society at Montreal by Mr. H. H. Lyman, Quebec by Rev. Dr. Fyles, and Toronto by Mr. J. B. Williams. The reports of the Treasurer, Librarian and Curator were presented by the respective officers, and that of the Delegate to the Royal Society by Mr. Arthur Gibson of Ottawa. This was followed by the election of officers for the ensuing year, 1908-9 (see page 6). Dr. Fletcher was unanimously re-elected President, and Mr. T. D. Jarvis and Dr. E. M. Walker, of Toronto, first and second Vice-President respectively; the latter appointment was made in view of the fear that Dr. Fletcher might be incapacitated from accepting any office. This apprehension proved unhappily to be well-grounded; our reverend and beloved friend died two days later—an account of his life and fatal illness will be found in another part of this report. At a subsequent meeting of the Society held on November the 18th, Mr. Jarvis was elected President and Dr. Walker, Vice-President.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present the report for 1907-8.

The forty-fourth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on October 31st and November 1st. Many members from a distance, almost all of the local members and a considerable number of interested outsiders, including many of the students of the College, were present.

The first afternoon was devoted to a conference on Fruit-tree Insects. The chief insects discussed were the Fruit-tree Bark Beetle or Shot-hole Borer, which had been doing much damage to Cherry trees in the Niagara district during the season, Codling Worm, Oyster-shell, Terrapin and San José scales, and the Woolly Aphis. This discussion was followed by the "Reports on Insects of the Year" by the directors from their respective divisions of Ontario. In the evening the president, Dr. Fletcher, delivered his inaugural address entitled "The Entomological Outlook." This was followed by a very interesting and instructive illustrated lecture by Mr. A. H. Kirkland of Boston, Mass., on "The Gypsy and Brown-tail Moths in Massachusetts." The morning and evening of the second day were occupied with the reading of reports from the branches and officers of the Society and a series of scientific and practical papers on various subjects. In the evening session Dr. E. M. Walker of Toronto University gave an illustrated lecture on "Collecting and Rearing Dragon Flies at the Georgian Bay Biological Station." All of these papers and addresses have been published in the annual volume.

This volume, the 38th Annual Report to the Legislature of Ontario, was published early in March, and contained 136 pages, and four excellent half-tone plates of Galls from a variety of plants. Besides the papers

already mentioned it included the following articles: "Voices of the Night," by Dr. Fyles; "A Preliminary List of the Scale Insects of Otnario," by Mr. T. D. Jarvis; "The Lime-Sulphur Wash," by Mr. L. Caesar; "An Unusual Outbreak of Halisidota Caterpillars," by Mr. A. Gibson; "Additional Insect Galls of Ontario," by Mr. T. D. Jarvis; "Injurious Insects in Ontario in 1907," by Dr. Bethune; "A Remarkable Outbreak of the Variegated Cutworm," by Dr. Bethune and Mr. L. Caesar; "Two-winged Flies," by Dr. Fyles; "A Report of the Summer Meeting," by the Secretary; and "The Entomological Record," by Dr. Fletcher and Mr. A. Gibson.

"The Canadian Entomologist," the monthly magazine of the Society, has been regularly issued at the beginning of each month. The 39th annual volume was completed in December last and eleven numbers of the 40th volume have already been published.

The volume for 1907 consisted of 423 pages and was illustrated with eleven full-page plates and a number of figures from original drawings. The contributors were 73 in number and included writers in Ontario, Quebec, Manitoba, Alberta, British Columbia, the United States, Cuba, Jamaica, the Hawaiian Islands and England. The articles are for the most part of a scientific character and contain, among much highly valuable matter, descriptions of eleven new genera and 222 new species and varieties of insects belonging to various orders. There is also a series of articles by different authors on subjects included under the title of "Practical and Popular Entomology." The material contained in the volumes of our magazine is so indispensible to specialists in all departments of Entomology that there is a steadily increasing demand for volumes and numbers, and occasionally for complete sets.

The reports from the Branches of the Society at Montreal, Quebec, Toronto and British Columbia are very satisfactory, meetings having been regularly held and many papers read and discussed. The Bulletin published quarterly by the British Columbia Society contains lists of local insects and many notes and observations of a highly interesting character.

From October to the third week in March meetings of the Society have been held every alternate Wednesday evening in the Biological lecture-room of the Ontario Agricultural College at Guelph. The attendance throughout has been satisfactory and a gratifying amount of enthusiasm has been shown by the members throughout the year. The following is a list of the papers read at the meetings: "The Cynipid Galls," by Mr. W. R. Thompson; "The Fight against the Brown-tail Moth in Nova Scotia," by Mr. T. Brady; "Wing Classification of the Heteropterous Land Forms," by Mr. R. C. Treherne; "Parasitism," by Mr. G. M. Frier; "Adaptions of Aquatic Insects," by Mr. L. Caesar; "Fungi that attack Insects," by Mr. J. W. Eastham; "Insects as carriers of Disease," by Mr. T. D. Jarvis; "Reminisscences of Entomologists whom I have known," by Dr. Bethune.

It is with deep regret that the Council records the death in his 67th year of Mr. John A. Balkwill, Director for the London District, and for several years the efficient Treasurer of the Society, which took place at his residence in London on the 10th of October, after a few weeks' illness. While much interested in Entomology, he was particularly devoted to Botany and Horticulture, and was familiar with all the wild plants in the neighborhood of London. He was the first President of the local Horticultural Society and continued to be an active member of its directorate, taking a leading part in its annual floral exhibitions and in the general improvement of the parks, boulevards and gardens of the city. The members of the Council beg

to offer to his widow and family their respectful sympathy in the bereavement that they have sustained.

The Council has also to lament the death of one of the Honorary Members of the Society, Dr. William H. Ashmead, which took place on the 17th of October. For nearly thirty years he was a constant and valued contributor to the pages of the "Canadian Entomologist" and had attained a high reputation among all students of this department of science from the thoroughness of his work. He had devoted himself especially to the study of the Hymenoptera and became the chief authority on the order in North America. His death at the early age of 53 years is a distinct loss to science and leaves a gap that it will not be easy to fill.

Respectfully submitted,

Tennyson D. Jarvis,
Vice-President.

ANNUAL REPORT OF THE MONTREAL BRANCH.

The 294th regular, and 35th annual meeting of the Montreal Branch was held in the rooms of the Natural History Society, Drummond Street, on Saturday evening, May 16th, 1908.

Members present: Messrs. Geo. A. Moore in the Chair; Henry H. Lyman, E. C. Barwick, G. Chagnon, A. E. Norris, A. F. Winn.

The Secretary read the following report of the Council.

During the season 1907-08 meetings have been held monthly except in July and August, making ten in all, the average attendance being 7½, and two meetings of the Council have been held. The papers read at the meetings were as follows:—

Annual Address of President, Geo. A. Moore.
Hemiptera taken at St. Madeleine, Quebec, May 24, Geo. A. Moore.
Notes on Coleoptera taken at St. Madeleine, G. Chagnon.
An Afternoon at Highgate Springs, Vt., A. F. Winn.
Canadian Cerambycidæ, 1907, G. Chagnon.
Sugaring Record—August, 1907, A. F. Winn.
Hemiperta taken at Lacolle, Quebec, July 19-31, G. A. Moore.
Report on Boston Meeting Ent. Soc. of America, and Work on Brown-tail and Gypsy Moths, Henry H. Lyman.
A Field of Golden-rod, A. F. Winn.
Notes on collecting Sthenopis thule, E. Denny.
Note on Sphinx Canadensis, E. C. Barwick.
Variations in shade of Samia cecropia, E. Kollmar.
On the Oriental Moth, Henry H. Lyman.
An Account of the Annual Meeting at Guelph, Henry H. Lyman.
Plusia precationis at Petunia blossoms, A. F. Winn.
Further Notes on Hepialus thule, Henry H. Lyman.
Larval habits of Pyrausta theseusalis, walk, G. Chagnon.
An odd Home for a Micro Larva, A. F. Winn.
Another Fortnight at Biddeford, Me., A. F. Winn.
Notes on Hemiptera taken at Biddeford, Me., Geo. A. Moore.
Collecting and breeding Notes for 1907, Henry H. Lyman.
A few remarks on the Season's Work, E. Denny.

My best Captures for 1907, G. Chagnon.
Notes on the Season 1907, A. F. Winn.
On the attraction of Male Moths to bred females, E. C. Barwick.
Notes on the English Season 1907, L. Gibb.
Habits of Insects as a Factor in Classification, Prof. H. Osborne, (selected) read by Mr. Lyman.
A Trip to Chicago and Decatur, Ill., Henry H. Lyman.
Type and Typical, Henry H. Lyman.
Our Meetings—a Statistical Review, Henry H. Lyman.
Evolution of a Locality Label, A. F. Winn.
North American Species of Monohammus, G. Chagnon.
A little Journey to the Home of Mr. E. P. Van Duzee, G. A. Moore.
Entomological Reminiscences, Henry H. Lyman.

While the average attendance at the meetings is smaller than might be hoped for, it is gratifying to your Council to be able to state, that not only has the work of contributing papers been shared among the members, but also that the total of 34 papers is the largest number for any year in the history of the Branch. During the year we have added four names to our roll, but we have lost from our active list—for the time being—Mr. G. R. Southee, whose business position has necessitated his removal to Calgary, Alta. However, we feel sure he will favor us from time to time with accounts of his work among the butterflies and moths of that vicinity. We had the pleasure of having Mr. C. H. Young of Ottawa at our October meeting.

One field day was held at St. Madeleine, Quebec, on May 24th, but weather conditions were very unfavorable.

The collection of photographs of members has been added to by the presentation of a portrait of the late Mr. Robert Jack.

In the library have been placed copies of the current numbers of the Canadian Entomologist, the annual report of the Parent Society for 1907, report of the South London Entomological Society, 1907, Dr. Fletcher's "Weed book," the N. Y. State Entomological publication and the Plates of Wright's Butterflies of the west coast.

The Curator's duties have not been made arduous by the addition of any new specimens, but the collection is in good condition, and any duplicates the members can spare will be very acceptable. The Treasurer presented a statement showing a balance on hand of $65.35.

The following officers were elected: President, Geo. A. Moore; Vice-President, Henry H. Lyman; Secretary-Treasurer, A. F. Winn; Curator and Librarian, L. Gibb; Council, E. C. Barwick, G. Chagnon and E. Kollmar.

ALBERT F. WINN, *Secretary-Treasurer.*

REPORT OF THE QUEBEC BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The season of 1908 has been a very remarkable one. We have had a long continuance of fine weather and a great lack of rain. The long drought dried the leaves on the trees and they began to fall before the frosts came.

There have been destructive forest fires all around us, and the air has been full of smoke—at times so dense as seriously to impede navigation.

In consequence, there have been but few insects on the wing, but Mrs. Turner took a lovely specimen of *Hyphoraia parthenos*, Harris, at her summer residence on the Island of Orleans. Mr. Boulton captured several interesting specimens on the same island, amongst them one of *Phycanassa viator*, Edw. This insect is rare in our locality.

We are greatly indebted to Miss Freeman for several valuable donations for our cabinet, of choice specimens from the South and West of America.

We have heard with deep concern of the serious illness of J. H. Simmons, Esq., a member of our council. Many earnest prayers are offered on his behalf.

The Rev. Dr. Fyles has retired from the position of chaplain at Quebec for the S.P.C.K., and intends to move from this neighbourhood shortly. He has therefore felt called upon to present his resignation of the office of president of the Branch. He has done so with regret. The loss of his valuable services will be greatly felt by the members of the Branch whose best wishes accompany him to his new home.

(Signed) R. A. M. Boulton,
President.

Crawford Lindsay,
Sec.-Treasurer.

Report of Council.

The Branch now numbers 29 members.

The secretary-treasurer's report will be submitted to you.

During the year papers were read on the following subjects:—

By the President, Rev. Dr. Fyles: "Two-winged Flies," "Variations in Insects," "Southern Hawk Moths," "Form and habits of the mole cricket."

By Mr. R. A. M. Boulton: "Moths collected by the electric light at Montmorenci Falls," "Buterflies of the New Forest, England."

The thanks of the Branch are due to the authorities of Morrin College for allowing the members the use of their rooms.

(Signed) Crawford Lindsay,
Sec.-Treasurer.

At the annual meeting held on the 24th October, 1908, the officers for the coming year were elected as follows:—

Honorary President: Hon. R. Turner, M.L.C.
President: Mr. R. A. M. Boulton.
Vice-President: Mrs. R. Turner.
Secretary-Treasurer: Lt.-Col. Crawford Lindsay.
Council: J. H. Simmons, Esq., James Geggie, Esq., Miss Bickell, Miss Freeman, Miss Hedge.

(Signed) Crawford Lindsay,
Sec.-Treasurer.

REPORT OF THE TORONTO BRANCH OF THE ENTOMOLOGICAL SOCIETY FOR 1907-8.

The twelfth annual meeting of the Society was held on Tuesday, May 26, 1908, in the Provincial Museum, St. James' Square.

The President, Dr. Brodie was in the chair, and the following members were present:—Mr. Coleman, Mr. Webb, Mr. Williams, Mr. Woods, Miss Blackmore, Dr. Abbott.

The following officers were elected for 1908-9:—

President: Dr. Brodie.
Vice-President: Dr. Walker.
Secretary-Treasurer: Mr. Laing.
Librarian: Mr. Williams.
Curator: Mr. Laing.
Council: Mr. Woods, Mr. Webb, Mr. Ivey, Dr. Abbott.

During the past year 12 meetings were held with an average attendance of 8. The Society also spent a day at Niagara Glen which was both profitable and enjoyable.

The membership of the Society has increased to 30. As a number were comparatively young in the study of Entomology, an effort was made during the past winter to study the orders systematically. A committee for identification was also formed so that members might have some assistance in identifying their specimens. The study of Botany, in so far as it relates to the life history of insects, has also been introduced.

The work of making as complete a record as possible of the fauna and flora of Niagara Glen has also been proceeded with and reports from several members have been made.

The subject of Insect Mimicry has received much attention, and discussion, as the list of papers appended will show.

The treasurer's report shows the finances to be in a satisfactory condition with a balance in hand of $4.51.

List of Papers Read.

Characteristics of the Order Orthoptera—Dr. Walker.
Defence of Theory of Mimicry—Dr. Walker.
Insect Mimicry and Evolution—Dr. Brodie.
The Order Lepidoptera—Mr. Williams.
Arrangement of Insects according to habit—Dr. Brodie.
Interior of Africa—Mr. Thurston.
Galls—Mr. Cosens.
Relation of Plants to Insects—Mr. Ivey.
Aquatic Hemiptera—Dr. Walker.

Respectfully submitted,

E. Blackmore.
Sec.-Treasurer.

FINANCIAL STATEMENT.

Of the Entomological Society of Ontario made to the Department of Agriculture for the Province of Ontario for the year ending August 31st, 1908.

Receipts.		Expenditures.	
Cash on hand from previous year as per last report	$640 73	Supplies of pins, cork, etc.	$51 67
Members' fees and subscriptions to "The Entomologist"	402 31	Back volumes	2 00
Sales of cork, pins, etc.	68 49	Fees remitted	5 11
Sales of back numbers of "Entomologist"	121 70	Printing	869 02
Advertisements in "The Entomologist"	52 75	Expenses—Postage, express, etc.	47 42
Government grant	1,000 00	Annual meeting	109 31
Interest on bank deposits	11 28	Library	11 31
Printing—Sale of extra pages, cuts, etc.	32 20	Annual report	114 29
Expenses—Return of postage by Government, etc.	10 41	Salaries	300 00
		Honorarium—Dr. Bethune for services in moving headquarters	50 00
Total	$2,339 87	Total	$1,560 13
		Balance on hand August 31st, 1908	$779 74

Examined and found correct this 5th day of November, 1908.

J. W. Eastham, }
J. W. Crow, } Auditors.

STATEMENT OF ASSETS AND LIABILITIES.

Assets.

Cash in bank	$779 74
Books and magazines in library	2,500 00
Museum	1,600 00
Wood cuts, plates, electros, etc.	700 00
Office furniture	75 00
Back numbers of the Canadian Entomologist and annual reports	850 00
Microscopes	225 00
	$6,729 74

Liabilities.

Nil.

S. B. McCready,
Treasurer.

CURATOR'S REPORT.

During the past year, as in previous years, the curator's work has been chiefly the general care and supervision of the Society's collections and the recording and placing of new specimens received from members of the Society. Last year lists of the species especially desired for the Society's collections were prepared and sent out to some of the members. These lists were long and contained many common species and gave the idea to some of the members who received them that the Society's collections were far from being representative of the fauna of Canada. This, however, is not the case as nearly all the common species appearing in the lists are in the Society's collections but many of them lack date and locality labels, and some of them are old and imperfect specimens. Thus they were included in the lists in the hope that in time all the common species might be represented in the Society's cabinets by perfect specimens bearing date and locality labels.

Since the last report the following contributions have been received and our sincerest thanks are due to the generous contributors for the same: 6 specimens of Coleoptera, by A. Gibson, Ottawa; 2 specimens of Lepidoptera, by James Fletcher, Ottawa; over 200 specimens of Lepidoptera, by Mr. F. H. Wolley Dod, of Millarville, Alberta; 50 specimens of Lepidoptera, by Mr. Charles R. Ely, of Washington, D.C.; 87 specimens of Cuban Lepidoptera, by Mr. Charles T. Ramsden, Guantanamo, Cuba.

In conclusion, the curator begs to remind the members of the Society that specimens, especially of rare and new species, are always most acceptable, and help to make the Society's collections more representative and of more value to every member of the Society.

Respectfully submitted,

J. E. Howitt,
Curator.

REPORT OF THE LIBRARIAN.

During the year ending August 31st, 1908, forty-nine bound volumes have been added to the Library, making the total number on the register 1,971; also a very large number of periodicals, pamphlets and bulletins, many of which will be bound during the next few months. Among the new books may be mentioned the English reprint by Mr. P. Wytsman, of Brussels, of Hubner's Sammlung Exotischer Schmetterlinge (*Lepidoptera Exotica*), edited by Mr. W. F. Kirby, of the British Museum; this work, which has been issued in parts during the last fourteen years and is now completed, forms three large quarto volumes and contains 491 hand-coloured plates of Lepidoptera, carefully copied from the originals, together with notes by the Editor on all the species depicted. The Farm Weeds of Canada, by Dr. Fletcher, with coloured illustrations of a large number of species, is another noteworthy addition to the useful books in the library. Thirty-eight volumes have been taken out by members during the year, but this does not at all indicate the use that has been made of our books as they are being consulted almost daily by students and members of the Society.

Respectfully submitted,

Charles J. S. Bethune, *Librarian.*

REPORT TO THE ROYAL SOCIETY OF CANADA.

By Arthur Gibson, Ottawa.

As delegate from the Entomological Society of Ontario, I have the honour of presenting the following report of the work of the Society during the past year.

The annual meeting of the Society was held on October 31st and November 1st last, at the Ontario Agricultural College, Guelph, the headquarters of the Society. This meeting was a most successful one and a large number of prominent entomologists and others were in attendance during the two days' session. A feature of the annual meeting of this Society is the reception and discussion of the reports of the directors of the six Districts in Ontario into which the economic work of the society is divided. In these reports mention is made of the insects which have been particularly destructive during the season. The annual report of the Society appeared in March last and in this an account of the proceedings of the above meeting are given, as well as most of the papers which were presented at the sessions. Among these latter the following may be mentioned:

"The Entomological Outlook" (Presidential Address). By Dr. J. Fletcher.

"The Gypsy and Brown-tail Moths in Massachusetts." By Mr. A. H. Kirkland.

"Voices of the Night." By Rev. Thos. Fyles.

"Collecting and Rearing Dragon-flies at the Georgian Bay Biological Station." By Dr. E. M. Walker.

"A Preliminary List of the Scale Insects of Ontario." By Mr. T. D. Jarvis.

"The Lime-Sulphur Wash." By Mr. L. Caesar.

"An Unusual Outbreak of Halisidota Caterpillars." By Mr. Arthur Gibson.

"Additional Insect Galls of Ontario." By Mr. T. D. Jarvis.

"Injurious Insects in Ontario in 1907." By Rev. Prof. Bethune.

"Entomological Record, 1907." By Dr. James Fletcher and Mr. Arthur Gibson.

During the year the Society also held a summer meeting at the Ontario Agricultural College, on July 4 and 5, when interesting papers were presented by Mr. H. H. Lyman on "Thecla calanus and edwardsii"; Mr. C. W. Nash on "Balance in Nature"; Dr. Henry Skinner on "Insects as Carriers of Diseases"; Dr. J. Fletcher on "Nature Study as a Means of Education"; Dr. W. Brodie on "The Life-history of a Colony of the Tent Caterpillar," and Mr. C. W. Nash on "Instinct *vs.* Education." An excursion was also held to Puslinch Lake, about nine miles from the college, many specimens of interest being collected.

The Branches of the Society at Quebec, Montreal, Toronto, Guelph and Vancouver, have all been actively at work during 1907, and much useful work in entomology is being thus encouraged at all of these centres. Regular meetings during the winter have been held by all of these Branches of the Society and many interesting papers have been presented and discussed.

During the year 22 bound volumes have been added to the Society's library at Guelph, besides a large number of periodicals, bulletins and pamphlets. Many of these latter are being bound up into permanent volumes.

This library which is one of the most complete entomological libraries in America is continually being used by members of the Society and by students specializing in entomology at the Ontario Agricultural College.

The collections of insects belonging to the Society have been materially added to during the year and considerable work has been done in going through the cabinets and rearranging the specimens.

The Canadian Entomologist, which is published by the Society, is now in its 40th volume. Volume XXXIX, which ended with the December, 1907, number comprised 423 pages, with 11 full page plates and 23 figures in the text. No less than 73 different entomologists contributed to the volume, and 11 new genera, 216 new species and 5 new varieties are described.

These papers are of a high character and in a report like this it is impossible to mention very many of them. Some of the more important, however, are. "New Micro-lepidoptera," by Mr. W. D. Kearfott; "New species of North American Lepidoptera," by Dr. W. Barnes; "Notes on Chalcolepidius and the Zopherini," by Major Thos. L. Casey; "On the Classification of the Mosquitoes," by Dr. Harrison G. Dyar and Mr. Frederick Knab; "A New Somatochlora, with a Note on the Species known from Ontario," by Dr. E. M. Walker; "Habits of some Manitoba 'Tiger Beetles' (*Cicindela*)," by Mr. Norman Criddle; "Studies in the Genus Incisalia," by Mr. John H. Cook; "The Eupitheciae of Eastern North America," by Rev. G. W. Taylor; "List of Hemiptera taken at Como, Quebec," by Mr. G. A. Moore; "The Classification of the Culicidae," by Miss Evelyn Groesbeeck Mitchell; "The Stridulation of the Snowy Tree-cricket (*Œcanthus niveus*)," by Mr. A. Franklin Shull; "New Coleoptera from the Southwest," by Mr. H. C. Fall; Tenthredinidae of Colorado," by Mr. Geo. P. Weldon; "New Tropical American Hesperidae," by Mr. Geo. A. Ehrmann; "Perlidæ from British Columbia and Alberta," by Mr. Nathan Banks; "*Diplonychus*, Laporte (—*Hydrocyrius*, Spinola), and its Relation to the other Belostomatid Genera," by Mr. J. R. de la Torre Bueno; "New species of Colorado Aphididæ, with Notes upon their life-habits," by Prof. C. P. Gillette: "Further Notes on the Occurrence of Hepialus thule, Strecker, at Montreal," by Mr. H. H. Lyman.

Besides the above technical papers, the following appeared under the heading "Practical and Popular Entomology":

"How Insects are Distributed." By Mr. L. Caesar.

"A Homemade and Effective Insect Trap." By Mr. John D. Evans.

"The Scolytidae or Engraver-Beetles." By Mr. J. W. Swaine.

"The Walking-Stick Insect" (*Diapheromera femorata*). By Mr. J. B. Williams.

"Fumigation with Hydrocyanic Acid Gas for Beginners." By Prof. Glenn W. Herrick.

The Society now has 185 Canadian members. The Canadian Entomologist is sent out to 486 subscribers each month as it is issued. Besides the subscribers there are on the Exchange List, the names of 112 Societies, etc., which receive the Canadian Entomologist regularly.

THE ECONOMIC IMPORTANCE AND FOOD HABITS OF AMERICAN GALL MIDGES.

By E. P. Felt, Albany, N.Y.

The extensive and frequently severe depredations of the Hessian-fly, *Mayetiola destructor*, Say, are too well known to require extended notice in this connection, and the same is also true, though perhaps in a more limited sense, of the Wheat Midge, *Cecidomyia tritici*, Kirby. The genus Contarinia appears to be a very important one to the economic entomologist. It contains the somewhat well known Pear Midge, *Contarinia pyrivora*, Riley, a species which has been responsible in recent years for the destruction of considerable fruit in Connecticut, New York, New Jersey and presumably in adjacent states. A more recently discovered species is known as the Violet Midge, *Contarinia violicola*, Coq., a form which has proved a serious enemy of the extensive violet growing industry located in and about Rhinebeck, N.Y., and one that bids fair to cause more injury in the future unless growers are very careful to avoid conditions favorable for its multiplication. The Sorghum Midge, *Contarinia sorghicola*, Coq., another recent discovery, breeds in sorghum seed and, in recent records, has been credited with causing the common failure of this plant to produce a full crop of seed. A still later note states that this insect destroys all sorghum seed in Texas south of a certain line. The Cotton Midge, *Contarinia gossypii*, Felt, is a species of some economic importance, since it has been reported as injurious to cotton in the British West Indies. Still another form, *Contarinia negundifolia*, Felt, was reared from the leaves of a box elder and is possibly identical with the *Cecidomyia negundinis*, Gill., a species which has been recorded as decidedly injurious to its host plant on the college campus at Ames, Iowa.

There have been several other injuries by Cecidomyiidæ brought to notice recently. One of these is the extensive destruction of linden buds by a form which we have been unable to rear as yet. This insect was so abundant at Rhinecliff, N.Y., as to destroy from 50 to 75 per cent. of the buds on large trees, causing the death of numerous twigs and of a few large branches. Similar injury to young Catalpa trees has recently been recorded by Prof. Gossard and is probably due to the work of *Cecidomyia catalpæ*, Comst. Several years ago a small proportion of the grape blossoms in the Chautauqua grape belt were found infested by Cecidomyiid larvæ. This last season the insect, *Cecidomyia Johnsoni*, Sling., was so abundant in an acre of Moore's early grapes near Fredonia, as to destroy from 60 to 75 per cent. of the crop. Observations have shown this pest to be generally distributed throughout the grape belt, and it is very probable that some other mysterious failures of the crop were due to the work of this insect. A number of species are known to live in the buds of plants, and it is presumable that other bud-inhabiting forms, aside from those mentioned above, have caused or are able to cause serious losses. It is certain that members of the Cecidomyiidæ are capable of inflicting grave injury, and no scientist can state that any one species might not become destructive in the near future. More knowledge respecting this group is necessary before its economic status can be accurately fixed.

It is gratifying to state that some species of Cecidomyiidæ at least, are distinctly beneficial. The members of the genus *Aphidoletes*, Kieff., live at the expense of aphids, and are therefore beneficial. One species, *A.*

meridionalis, Felt, was reared a number of years ago from *Siphonophora liriodendri*. *Aphidoletes cucumeris*, Lintn., undoubtedly preys upon the melon louse, *Aphis gossypii*, Glov., though when it was described by the late Dr. Lintner as a *Diplosis*, it was supposed to be responsible for a bud gall. Another species of *Aphidoletes*, bred from the melon aphis and probably *A. marina*, Felt, was recently received from Prof. C. P. Gillette of Colorado, accompanied by the statement that it was particularly destructive to plant lice in the Insectary and was not uncommon out of doors, attacking different species of plant lice. The genus *Mycodiplosis*, Rubs., is zoophagous and it is gratifying to note that *M. acarivora*, Felt, preys upon the red spider infesting the Citrus trees of California.

The above is sufficient to show that the food habits of this group are of interest to the economic entomologist. We now propose to gvie some brief notes respecting the habits of various members of this family. The Campylomyzariæ include a considerable number of forms most frequently found in forests or in association with decaying vegetable matter. The very characteristic genus *Joanissia*, Kieff., presumably breeds in decaying vegetable matter, since Kieffer records rearing several species from decaying wood, tufts of moss and mold covering a fungus. Members of the genus *Campylomyza*, Meig., are rather common in woodlands. One species, *C. lignivora*, Felt, was reared in considerable numbers from the fungous affected heart wood of pine. The long, yellowish larvæ evidently eroded the tissues to a considerable extent, as the cavities inhabited by them were more or less filled with extremely fine wood flour. *C. pinicorticis*, Felt, was bred from galleries of a *Scolytid* in pine. *Campylomyza coprophila*, Felt, was obtained from manure, while *C. dilatata*, Felt, was reared from a vial containing elm seeds and debris. One species, *Campylomyza pomifloræ*, Felt, occurs commonly in early spring about blossoms of cherry and shadbush. The peculiar *Miastor americana*, Felt, was taken on either beech or chestnut leaves. Several species of *Brachyneura*, Rond., have been reared, *B. eupatorii*, Felt, being obtained presumably from an oval swelling on the stem of thoroughwort *Eupatorium perfoliatum*, and another, *B. vitis*, Felt, was reared from a jar containing the familiar *Lasioptera vitis*, O. S., gall on grape.

The Lasiopterariæ is a very characteristic group, the members of which appear to invariably undergo their final transformations within the tissues of the host plant. The peculiar *Clinorhyncha* seems to be restricted to the blossoms of certain compositæ, since *C. millefolii*, Wachtl., occurs in apparently normal florets of Yarrow, *Achillea millefolium*, while *C. eupatori-florœ*, Felt, may be obtained from similar flowers of thoroughwort *Eupatorium perfoliatum*. *Baldratia*, Kieff., is another exceedingly interesting genus, since most of its species breed in the peculiar, apparently fungous affected blister galls so common on aster and solidago. The sixteen species reared are divided about equally between species of aster and solidago. A few forms have been obtained from comparatively normal leaf tissues, and one interesting species bred from small, oval galls on aster leaves recognized simply by a slight elevation on the under surface. Members of the genus *Lasioptera* and *Neolasioptera* occur almost exclusively in stem galls on herbaceous plants and in subcortical galls on woody plants. The irregular eccentric stem gall of *Lasioptera tumifica*, Beutm., on solidago is an excellent type of one form of gall, while the irregular subcortical gall on Cornus, made by *Neolasioptera cornicola*, Beutm., illustrates the other. The species of both genera winter, so far as known, within the gall, those

inhabiting herbaceous plants usually appearing in rather early spring, while certain of the forms occurring in woody tissues do not emerge till June.

Representatives of the genus *Dasyneura* exhibit a marked preference for leaf folds, leaf buds or loose leaf bud galls. *Dasyneura anemone*, Felt, occurs in a loose apical bud of *Anemone canadensis*, while *D. clematidis*, Felt, inhabits an oval stem gall. The genus *Rhabdophaga*, as we understand it, exhibits a marked partiality for the willow, breeding for the most part in bud galls or woody tissues. Some eighteen species are known to inhabit this plant.

The Oligotrophiariæ is best represented by the genus *Rhopalomyia*, which latter displays a very marked preference for solidago, fifteen species occurring on this plant and subsisting at the expense of the flowers, the leaves, the stems, or even on portions of the underground root stocks. The species are easily reared and, so far as we have been able to determine, each is responsible for a peculiar type of gall. Six species of *Mayetiola* have been reared from willow, *M. walshii*, Felt, producing an apical rosette gall, *M. rigidæ*, O. S., forming a characteristic apical beak gall, while the other species occur in woody tissues.

The Asphondyliariæ is a very well marked group exhibiting considerable similarity in habit. The typical genus *Asphondylia* may well be represented by the common *A. monacha*, O. S., a species which breeds in both solidago and aster. It has been reared from apparently unaffected blossoms of plants belonging to both genera. It occurs in small rosette galls on the narrow-leaved solidago, *Euthamia lanceolata*, and has been reared from what we have designated as the adherent leaf gall on *Solidago canadensis* and *S. serotina*. This latter gall is simply an oval cell formed by two leaves adhering at the margin of the cavity. Most of the species of *Asphondylia* occur in bud galls, and it is probable that some forms are injurious. The allied *Schizomyia* likewise breeds in bud galls or may be responsible for modifications of the same such as the hard, nut-like, polythalamous gall of *Schizomyia pomum*, Walsh, much better known as *Cecidomyia vitis-pomum*. A large, oval or fusiform petiole or tendril gall is made by *S. petiolicola*, Felt. The genus *Cincticornia* is also included in this group and breeds, so far as known, in leaf galls. *Cincticornia caryæ*, Felt, was reared from a conical leaf gall on hickory, while *C. pilulæ*, Walsh, better known under the name of *Cecidomyia*, inhabits the common reddish, ovate hard leaf gall on oak.

The Diplosariæ includes a large number of forms most easily recognized by the two swellings on each antennal segment in the male. Practically nothing is known concerning the life history of the larger, heavier forms of *Hormomyia*, though some of the smaller, lighter forms have been reared, such as *H. caryæ*, O. S., and *H. holotricha*, O. S., both better known under the name of *Cecidomyia*. *H. cratægifolia*, Felt, has been reared from a cockscomb gall on Cratægus leaves. *Cecidomyia resinicola*, O. S., is interesting because the larvæ occur in pitch masses. Many species belonging to this group may be bred from buds or leaves and a few, as mentioned in the preceding economic discussion, from seeds. We have reared a number of species of *Mycodiplosis* and particularly of *Lestodiplosis* from various leaf galls. The habits of these species are not sufficiently well known so that we feel certain that in every instance we have secured the form responsible for the deformity. There is still need of much life history work in this group before certain puzzles as to relationships and food habits can be satisfactorily solved.

Comparatively little is known concerning the food habits of our Epidosariæ. *Asynapta saliciperda*, Felt, has been reared from old, dried *Rhabdophaga batatas*, Walsh, galls, while *Winnertzia pinicorticis*, Felt, was bred from under the bark of *Pinus inops*. This group presents great structural variations and it is to be expected that further investigations will disclose considerable variation in habits.

The Cecidomyiidæ show some exceedingly interesting preferences in the selection of food plants. For example, 39 species have been reared from solidago, 15 of these belonging to the genus *Rhopalomyia;* 28 species have been bred from Salix, 16 from aster and 10 from grape. *Lasioptera* exhibits a marked partiality for aster and solidago. The latter is also a prime favorite with *Rhopalomyia*. The genus *Rhabdophaga* occurs mostly in *Salix* and a number of species of *Mayetiola* also live upon this plant. The species of *Asphondylia*, probably because of their inhabiting buds, do not display a marked preference for any food plant. The Asphondylid genus *Cincticornia* is found largely in leaf galls on Quercus, while the smaller forms of Hormomyia are equally partial to various hickory leaf galls. The statistics just given are based upon rearings of over 300 species. The data presented can not be regarded as conclusive because most of the rearings have naturally been made from plants most easily secured or from which insects were most readily bred. Some idea of the extent and complexity of this work may be gained when it is remembered that we now know some 700 North American species, representing about 50 genera.

After some remarks upon the paper by the Chairman, a discussion arose respecting the nomenclature of galls and the insects that produce them, which was participated in by Messrs. Jarvis and Nash and Drs. Felt and Bethune. The conclusion arrived at was that names employed to designate botanical structure alone should not necessarily be attached to zoological species, that is to say that a name given to a gall with a description of the gall only and perhaps also of the larva found in it should not hold in entomology; that the only specific names to be recognized should be based upon the description of the adult perfect insect. Otherwise it was felt that great confusion must sooner or later arise.

Mr. W. R. Thompson, of the Ontario Agricultural College, Guelph, gave an interesting account of the work now being carried on in Massachusetts for the rearing of native and imported parasites of the Gypsy and Brown-tail Moths. He was engaged during the summer months as an assistant to Mr. C. H. T. Townsend, who is in charge of the parasitic work, especially as regards the Dipterous family Tachinidæ. Mr. Thompson described fully and clearly the various operations carried on in connection with the importation of nests of Brown-tail Moth caterpillars, predaceous beetles, etc.; and the methods employed in rearing the larvæ and obtaining the parasites on their emergence from the host caterpillars. He also explained some of the apparatus used by means of drawings on the blackboard. His narration was listened to with much attention and gave those present an excellent idea of this notable experiment in economic Entomology. As Dr. Howard, who is in charge of the whole work, sent a paper on this subject, which was read at the evening session, Mr. Thompson preferred that his descriptions should not be published.

OBSERVATIONS ON THE SORGHUM MIDGE.

By R. C. Treherne, Ontario Agricultural College, Guelph.

Before commencing the discussion of my subject, I should like it understood at the outset that the observations recorded have not yet been confirmed by repetition, and, no doubt, therefore, some of them may not be entirely correct. The first study of the life-history of any insect is apt to be wrong in many respects, as we find, for instance, was the case with the first published statements made at the beginning of the Mexican Cotton-boll Weevil investigations, I purpose, therefore, to give a mere outline of such observations on the life-history, distribution and habits of the Sorghum Midge as came under my notice during this summer of 1908, and crave indulgence for the apparently inconclusive form of some of my records. Again I ask you to bear in mind that the work was undertaken by a student, the result of whose work still awaits proof.

Sorghum is grown in Louisiana in comparatively small areas, nearly every plantation, however, possessing a patch which rarely exceeds half an acre in size. General, therefore, as the growing of this crop would seem to be, it has for a considerable time been regarded as one which did not mature its seed. Investigations into the cause of this non-maturity did not greatly exercise the minds of the planters for the reason that the crop was not grown for its seed production, but was grown rather for green feed and for the manufacture of molasses. General theories were advanced as to the cause of this non-fruitage, but the attacks of the Sorghum Midge on the ovaries of the sorghum plant now seem to be the most potent and the main cause as yet determined. Yet it would be incorrect to say that the failure of sorghum to mature its seed in Louisiana was entirely due to the work of this midge, for the reason that the Sugar-cane Borer, *Diatræa saccharalis*, F., the moth *Nigretia sorghiella*, Riley, the Sorghum Smuts, the English Sparrows and I have no doubt yet other destructive agencies, are all means which help to prevent the sorghum crop from maturing its seed in the South.

So far as we know, this insect was first mentioned and described by Professor D. W. Coquillet in Bulletin 18, N. S. Bureau of Entomology, on "A Cecidomyiid Injurious to the Seeds of Sorghum." His description was taken from some specimens sent from Alabama in 1895. The midge seems not to have attracted further attention until 1907, when Mr. C. R. Ball, of the U. S. Department of Agriculture made a number of observations on its destructiveness in Louisiana. During this summer of 1908, systematic investigations on the life-history and habits of this midge, were begun, with the result that Professor F. M. Webster, who has the matter in hand, possesses considerable data to verify and to resume work on, if so desired, at an early date next year.

With the adult flies of this species, the two sexes are of practically the same dimensions, the females, however, on a superficial examination, appearing, on account of their length of ovipositor and somewhat plump abdomens, to be the larger. The abdomens of both sexes are brick red in general color, while their heads and thoraxes present black indications. The antennæ of the males are considerably longer than those of the females and it is by this characteristic that the two sexes are most easily recognized. The females are somewhat more sluggish in their movements than the males. The males, on the other hand, are the more active and are usually seen on

the wing hovering around the heads of sorghum in the early morning, evidently awaiting the emergence of the females. The total length of the life of the female is about 32 hours, that is to say, when facilities for the deposition of her eggs are given her soon after emergence. The males live about half as long as the females. No attempts to breed this fly to maturity under artificial conditions were successful.

The egg is elongate in form and cylindrical, tapering towards the end and is about .28 mm long and about .09 mm broad and resembles very nearly the eggs of closely related species. It is laid by the female fly between the glumes of the sorghum spikelet and on or very near the ovary of the plant so that when the young larva develops it may find abundance of food ready at hand without material need of any search. The injury to the ovary of the plant is caused, evidently, by absorption of the juices of the ovary by the larva which appears to carry out the extraction throughout the entire length of its body. The larva when full grown is brick red in general color and the developing pupa possesses the same characteristic shade. When the period for transition from pupa to adult approaches, the pupa works its way upwards and the emergence occurs at the apex of the glumes. After emergence takes place, several seconds are allowed for wing development.

I think I may mention here that there is, at present, in Louisiana an extremely interesting but obnoxious little ant, *Iridomyrmex humilis*, Mahr. This ant is over-running the southern portion of the State and is having considerable attention given to it by reason of its relationship to the agricultural interests of the State. In the sorghum patch in which the experiments with the sorghum midge were carried on this summer, this particular ant abounded. The ants were continually running about the leaves, stems and heads of the sorghum plants attracted evidently by the sweet sap of the plant and the excretions of the aphid which fed upon it. As the adult fly is about to emerge from the pupa, the glumes of the plant are necessarily forced slightly open and the ant, which is omnivorous, is thus allowed to gain access to the helpless pupa. I actually observed an instance where an ant bit off the terminal apex of the glumes and extracted the pupa. Other instances were observed in which the ant was unable to make its way to the enclosed pupa, probably, I suppose, on account of the glumes not being sufficiently open and hence not allowing of a good hold. I have no doubt that in a field in which this ant abounds, the death of many flies may be accounted for.

The total life-history of this species, according to Mr. C. R. Ball, varies from 14 to 20 days. This summer it was estimated that it ran perhaps somewhat longer, between 19 to 25 days. However, this is one of the points that still awaits proof. The entire life-history takes place within the sorghum flower, the egg being deposited there and the adult fly emerging from it when the required developmental period is accomplished. The general habits of this midge, therefore, can be seen to coincide very closely with the habits of already studied and familiar species of the same genus and closely related genera.

In Louisiana this midge is heavily parasitised by *Aprostocetus diplosidus*, Crawford. This parasite is accompanied by a species of Tetrastichus which Professor F. M. Webster considers as probably a secondary parasite.

In reference to the distribution of the midge, I may say that it is more generally to be found over the South than it was first thought. Early in the summer it was known to exist in comparatively few States, but it now appears that it has actually been found in Texas, Louisiana, Alabama, Arkansas, Missouri and South Carolina. For the reason that this midge

has not yet attracted the attention of the Experiment Stations, it is altogether probable that it is of more general distribution than these statements show. Its destructiveness, too, is of a varied description. In the alluvial lands of Louisiana, for instance, the main part of the crop is completely spoilt, while in the hill lands of the State, the crop is not so affected and again in Arkansas and Missouri the attacks of the midge are so inconsiderable that its presence would not be suspected.

I will close these remarks by asking an apology for placing before you records of an insect which is probably of only semitropical distribution, but I thought that, as its method of attack closely resembles the attack of nearly related species in the North and as these are practically some of the first remarks on this particular species, this paper might be of interest.

Mr. Treherne then exhibited a Cotton Plant which was grown in the College greenhouse and pointed out the various stages of growth—the bud, the square, the flower and the boll. The only time during the growth of the plant that poison can be satisfactorily applied against the plant's chief enemy, the Cotton Boll Weevil, is between the budding and the squaring stages. Any poison applied after the plant has formed squares is of no use against the weevil for the reason that once the square is formed, the insect feeds within it and hence does not come in contact with the poison.

Experiments have recently been conducted with powdered arsenate of lead as a new poison for the Boll Weevil. Great hopes are entertained by Prof. Wilmon Newell, of the State Crop Pest Commission of Louisiana that this poison will prove to be satisfactory. If these hopes are realized, arsenate of lead may possibly be of use to fruit-growers and gardeners in the North.

He next showed some specimens of the Fire Ant (*Solenopsis geminata*), which is so useful in excavating the larva of the Boll Weevil from the square; the Argentine Ant which is causing much consternation in the households of the South; the Texas Fever Tick and a parasitic fungus on the White Fly (*Aleyrodes*).

HYDROECIA MICACEA, ESP. IN CANADA.

By Arthur Gibson, Central Experimental Farm, Ottawa.

Of recent years much attention has been paid, by several entomologists, to the boring larvæ and the perfect moths of *Gortyna, Hydrœcia* and *Papaipema*. In Canada, the best work on these interesting insects has been done by our esteemed member, Mr. Henry H. Lyman, of Montreal. In the United States, our friend, Mr. Henry H. Bird, of Rye, N.Y., has carefully studied the life-histories of many species, probably the most of which have been described as new to science.

The larvæ of some of the moths of this group are, more or less, of economic importance. The Hop Vine Borer, *Gortyna immanis*, Gn., is well known from its ravages in hop yards. In the annual report of the Dominion Experimental Farms for 1892, Dr. Fletcher treats of this insect at considerable length and gives the life-history. The Columbine Borer, *Papaipema purpurifascia*, G. & R.,* is recorded as a destructive enemy of cultivated plants of the genus Aquilegia. The Stalk Borer, *Papaipema nitela*, Gn., is widely known from its attacks on potatoes, tomatoes and corn. The

*Report, Ent. Soc. Ont., 1904, p. 81.

Burdock Borer, *Papaipema cataphracta*, Grt., is very common in Ontario, and is sometimes very injurious to many kinds of garden plants having thick, succulent stems. It has a wide range of food plants, but in the Ottawa district it has been found boring chiefly in the burdock.

The species, however, which I wish to call special attention to to-day is one which has been reported to the Division of Entomology, on several occasions during the last four years. Attention was first drawn to it in August, 1905, when, early in the month, Mr. George Welch, of Westport, N. S., wrote asking for information as to how to destroy worms which were boring into the pods of his garden peas. He said that the worms were large and quite plentiful. Not recognizing the enemy, Dr. Fletcher wrote asking for specimens. Under date of August 31st, Mr. Welch sent two caterpillars, all he could find at that date, and mentioned that after the end of July they were not so plentiful. One of the larvæ, unfortunately, had died during transportation and the other specimen had changed to the chrysalis state. From this latter a perfect specimen of the moth was reared on Sept. 18th.

On July 13, 1906, Dr. C. A. Hamilton, of Mahone, N.S., forwarded a caterpillar which he had found in a corn stalk. Only one larva was found on that date, but Dr. Hamilton said that other plants had withered away, probably from the same cause. This caterpillar pupated on July 19th and the moth emerged on August 7th.

In 1907, another single larva was received, on July 12th, from Mr. Capel B. St. George, of Tramore, Ont., who stated that he had found it boring in corn in his garden. The moth from this specimen emerged on Sept. 6th.

On June 30th of the present year, Dr. Hamilton forwarded another specimen from Mahone, N.S., which he had found in corn. The moth emerged on August 6th. A larva had also been found a few days previously, but unfortunately had been lost, and a further plant was seen to be injured, but the caterpillar could not be found.

In the collection of insects of the Division of Entomology at the Central Experimental Farm, are two specimens of the moth, which were taken at St. John, N.B., on August 29, and September 12, 1902. These were sent to Dr. Fletcher under the name of *Gortyna medialis*, Sm. In Mr. McIntosh's list of the noctuidæ of New Brunswick,[1] the following note appears:

"*Hydræcia medialis*, Smith; one taken September 2nd, (1898)." In Dr. Fletcher's Entomological Record for 1903,[2] this moth is recorded as having been "very abundant, August and September, St. John, (McIntosh)." From this statement, and in view of the above occurrences at Westport, N.S., it will be seen that this insect is not uncommon during some seasons in the Maritime Provinces. The record of this insect having been found at Tramore, Ont., is very interesting. While the presence of isolated individual larvæ in corn, or other plants, is of no economic importance, still as shown above, the insect has on occasions been noticeably destructive. The habit of the caterpillars boring into the pods of garden peas, as observed by Mr. Welch, is certainly remarkable and is the only instance known to the writer of a larva belonging to this group boring into anything other than a stem or a root.

[1]The Noctuidæ of New Brunswick. Reprinted from Bulletin of the Natural History Society of New Brunswick, (St. John) No. XVIII., 1899.

[2]Report of the Entomological Society, 1903.

The following description of the caterpillar was taken from the specimen received from Dr. Hamilton in July, 1906:

Length, 32 mm. Head, rounded, chestnut brown, shining, mouth parts darker. Body: a dirty, creamy colour, with a pinkish tinge on dorsum, except at intersegmental folds. Thoracic shield pale brown, margined anteriorly with dark brown. Tubercles pale brown, each with a single pale hair. Tubercle IV on seventh abdominal segment is almost as large as the upper half of the spiracle, the upper edge being slightly above the upper edge of the spiracle. Spiracles black. Anal shield blackish. Dorsal vessel distinct. No markings whatever on the body. Feet all pale.

A description of the larva from Mr. St. George was also taken, but the only differences which my notes show, are that the thoracic shield was margined in front with black, and the body noted as being greenish-white with a rosy tint above spiracles except at intersegmental folds.

The moth reared from garden peas from Westport, N.S., was submitted to Mr. Henry Bird, who reported upon it as follows: "The Nova Scotian specimen looks like *medialis*. A series might be quite convincing." As this left some doubt about the exact determination of the moth, a specimen was sent to Sir George Hampson, of the British Museum, who determined it as *Hydræcia micacea*, Esp., with the statement that it was "exactly like European specimens."

In Miss Ormerod's Report for 1898, an account of injury to potatoes by *Hydræcia micacea* is given, under the popular name of the Potato-stem Borer. This outbreak which occurred at Fyvie, Aberdeen, Scotland, is described as having been destructive to the growing crop of potatoes, especially in gardens. The injury had been noticed every season for some years and a careful examination invariably showed that the damage had been done by the borer. Miss Ormerod quotes from Mr. Richard South: "This species is known to feed in larval stage in Dock and species of Equisetum." In Stainton's "Manual of Butterflies and Moths," vol. 1, p. 198, the larvæ are said to feed "in the roots of various Cyperaceæ." In Kappel and Kirby's "British and European Butterflies and Moths," it is stated that the larva "lives in the roots of *Glyceria spectabilis*, Iris, etc."

The moth which is known as the Rosy Rustic is stated to be "common and widely distributed in Central and Northern Europe in August and September." Miss Ormerod says: "The moth is from an inch and a quarter to a little over an inch and a half in expanse of the forewings, which are variously described as of a pale brown ground color with a rosy tinge, or of a 'rich, reddish brown'; on the wing is a 'broad dark patch', otherwise described as a 'broad median band', the outer portion being 'very rich, dark brown'. Hind wings 'whitish grey with darker central line', or 'dingy grey brown with a darker crescentic discoidal spot and transverse median bar'; the antennæ nearly white."

The above occurrences of *Hydræcia micacea* in Canada are, as far as we know, the only American records of this insect.

FURTHER NOTES ON THE COCCIDAE OF ONTARIO.

By Tennyson D. Jarvis, O.A. College, Guelph.

In last year's Annual Report, I gave an account of forty-eight species of Coccids for Ontario. Further collections and investigations have enabled me to add the following to the list.

Kermes galliformis (Riley), Red Oak, Toronto.

Saissetia hemisphaericum (Targ), Cotton, etc., Conservatories in most parts of Ontario.

Aspidiotus abietis (Schr.), Hemlock, Guelph.

Chrysomphalus aonidum (Linn.), Ficus elastica, Conservatory, Guelph.

Ischinaspis longirostris (Signoret), Palm, Conservatory, Toronto.

Undetermined Species of Pseudococcus.

On bark of Apple—*Pyrus malus*, Guelph.
" " Hawthorn—*Crataegus sp.*, Guelph.
" " Horsechestnut—*Aesculus hippocastanum*, Guelph.
" " Beech—*Fagus ferruginea*, Guelph.
" " Willow—*Salix sp.*, Guelph.
" " Lombardy Poplar—*Populus italica*, Guelph.
On leaves of Soft Maple—*Acer saccharinum*, Guelph.
" " Willow—*Salix sp.*, Guelph.
On roots of Raspberries—*Rubus strigosus*, Muskoka.
" " Blueberries—*Vaccinium Pennsylvanicum*, Muskoka.
" " Goldenrod—*Solidago canadensis*, Guelph.
" " Yellow Avens—*Geum strictum*, Guelph.
" " Yarrow—*Achillea millefolium*, Guelph.
" " Wormwood—*Artemisia sp.*, Guelph.
" " Ox-eye Daisy—*Chrysanthemum leucanthemum*, Guelph.
" " Daisy Fleabane—*Erigeron philadelphicum*, Guelph.

Kermes galliformis (Riley).

These scales occur either singly or in clusters on the twigs and branches of Red Oak (*Quercus rubra*). The form of the adult female puparium is globular with a slight incision for insertion on the stem of the food plant.

It is nearly smooth and somewhat shining. The colour is white and beautifully variegated with yellowish, gray and black. Mr. A. Cosens found this fairly common on Red Oak at Toronto.

Saissetia hemisphaericum (Targ.)

The adult female varies from light to dark brown, frequently shaded with darker brown to black.

It is more or less hemispherical or slightly elongate and convex. The surface is smooth and shining to the naked eye but with higher magnification is seen to be thickly studded with little dots. The immature female is usually of a pale yellow with a well defined central and two lateral carinae. It is a very common scale in conservatories throughout Ontario.

Aspidiotus abietis (Schr.).

Puparium of the female oval or elongate oval and the side next the midrib compressed and straight. About 1.5—2 mm. long and 1—1.2 mm. wide. Colour dark brown; back convex. Exuviae central, dull yellow. Common at Guelph on Hemlock (*Tsuga occidentalis*).

Chrysomphalus aonidum (Linn.).

Adult female puparium circular and somewhat convex. Colour reddish brown, turning paler towards the margin. Exuviae central, dark orange and nipple-like. It has been found in the conservatory at Guelph on *Ficus elastica*.

Ischnaspis longirostris (Signoret).

The puparium of the adult female is very long and narrow. Back shining black; exuviae orange coloured. A few specimens were found in a Toronto conservatory.

Distribution of San Jose Scale (*Aspidiotus perniciosus*) in Ontario.

The San Jose Scale is slowly gaining ground in Ontario. The most northern point of infection is at Lorne Park, County of Peel on the northern shore of Lake Ontario.

Fig. 6. The shaded portions of the map shew the counties of Ontario in which the San Jose scale is now established.

Three New Host Plants for Eulecanium Caryae in Ontario.

Rock Elm (*Ulmus racemosa*), Hornbeam (*Ostrya virginica*), Blue or Water Beech (*Carpinus caroliniana*). We have now five host plants for this scale in Ontario.

A New Host Plant for E. Fletcheri in Ontario.

This year *E. Fletcheri* was found at Guelph on Red Cedar (*Juniperus virginiana*).

ONE BROOD FOR THE PINE SCALE (*Chionaspis pinifoliae*) IN ONTARIO.

This scale passes the winter in the egg stage. The eggs hatch in the early part of June and the female reaches maturity about the middle of August when she lays her eggs which do not hatch until the following year.

SOME ENEMIES OF ONTARIO COCCIDAE.

BY J. W. EASTHAM, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Leaving out our wild birds, upon which I have nothing to say, the enemies of Scale insects or Coccidae may be divided into three classes, namely:—

1. Predaceous insects;
2. Hymenopterous parasites;
3. Fungus Diseases.

Amongst predaceous insects the members of the family Coccinellidae or Ladybird beetles are by far the most numerous and most important. Of these insects one of the most beneficial is *Hyperaspis signatus*—a small black beetle with a small red spot on each elytron. The larvae of the species of Hyperaspis do an immense amount of good by destroying large numbers of the egg sacs of the Cottony Maple-scale (*Pulvinaria innumerabilis*). The larvae are large, white and mealy, and much resemble certain species of Dactylopus, for which they might easily be mistaken by a casual observer. The larvae pass from one ovi-sac to another, devouring the eggs as they pass along, but leaving the ovi-sac apparently little the worse externally. During the summer fully 80 per cent. of the ovi-sacs of Pulvinaria in the vicinity of Guelph were destroyed by the Hyperaspis larvae.

Another very common and important species is the Twice-stabbed Lady-bird (*Chilocorus bivulnerus*), Fig. 7, the adults and larvae of which are to be found feeding on no fewer than seven species of scales in this neighbourhood. Its special favourites, however, are the Oyster-shell Bark-louse and Curtis Scales, on both of which it is usually quite common. It is interesting to note that the larvae of this insect are preyed upon to a considerable extent by Lace-wing fly larvae (*Chrysopa*). Figs. 8 and 9. Another species which preys more especially upon *Eulecanium cerasifex* is the 13-spotted Lady-bird (*Hippodamia 13-punctata*), Fig. 10. These larvae are very thorough in their work as they devour everything but the body walls of the scale.

Another common predaceous insect is a small mite *Monieziella, sp.* which is generally found feeding on the Oyster-shell Bark-louse and Curtis scale, especially the former; it is also found feeding on the eggs of *E. cerasifex* but not to any great extent.

Another predaceous insect occasionally to be found is a Lepidopterous larva which eats its way through the cottony masses of *Pulvinaria innumerabilis*, and in this way one caterpillar can destroy many scales. Although several attempts were made I was unable to rear the adult; but in all probability it is the larva of *Lactilia coccidivora*, Comst., an insect whose larvae prey on Pulvinaris to a considerable extent in some parts of the United States.

Turning next to the Hymenopterous parasites, we find that in this district they belong entirely to two sub-families of the Chalcididae or Chalcis Flies—the Aphelininae and Encyrtinae. These two families are readily

distinguished from each other by the fact that members of the Aphelininae have 8-jointed antennae, a divided meso-pleura, and the middle tibiae are not specially adapted for saltatory purposes. The Encyrtinae, on the other hand, are characterized by the large saltatory spine of the middle tibiae, which is generally long and stout, though less frequently it is found dilated at the base, and armed with a double-row of black teeth or spines. This last feature readily marks off Encyrtinae, as no other family, as far as I am aware, possesses this large saltatory spine.

The Aphelininae are generally parasitic upon the Aleyrodidae or, amongst Coccidae, upon members of the sub-family Diaspinae. The commonest member of this family is *Aphelinus mytilaspidis*, a small yellow parasite which attacks several species of scales but principally the Oyster-shell Bark-louse. The larva feeds on either the scale body or eggs according to the time of the year; but like most Aphelinids there is not usually more than one larva to a single scale. The larvae, when full grown, are about 1 mm. long and very stout, being almost as broad as long; the pupae, stout, dark and contracted.

It appears to be double brooded as the adults were reared at the beginning of June and end of August; the adults may be usually observed ovipositing on the young scales during June. Another closely related species

Fig. 7. Twice-stabbed Lady-bird, larva and beetle.

Fig. 8. Lace-wing fly and eggs.

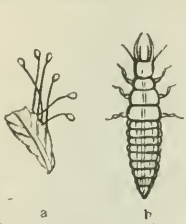

Fig. 9. Lace-wing fly eggs and larva.

Fig. 10. Thirteen-spotted ladybird.

is *Aphelinus fuscipennis* which attacks both San Jose and Curtis Scales. This parasite is widely distributed, one being common on San Jose Scales in some parts of the United States. It differs from the preceding species in having slightly clouded wings.

Another very important member of this family is *Coccophagus lecanii* —a small Chalcid with yellow markings upon the meso-scutum and scutellum. It is this parasite, acting in conjunction with *Hyperaspis signatus* mentioned previously, which so effectively controls the outbreak of Cottony Maple Scale (*Pulvinaria innumerabilis*). It is amongst the Encyrtinae, however, that we find the most important Hymenopterous parasites of the Coccidae. During the last summer some twenty species of parasites belonging to this family were reared by me from various scales—but principally from the various species of Lecanium. No fewer than ten of these species, or 50 per cent. were reared from one species of scale, namely *Eulecanium Fletcheri*.

The most common of the Guelph representatives of this family belong to the genus Comys, of which three species are found in this neighborhood.

Comys scutellata is a large, handsome species which parasitizes *Eulecanium caryae* to such an extent that few scales escape. It is probably a European species, accidently introduced and now widely distributed in North America. *Comys fusca*, a closely allied form, is very common around

Guelph parasitizing the New York Plum Scale (*E. cerasifex*). It is this parasite which is so effective against the Brown Scale in parts of California.

Other common genera belonging to this family are Blastothrix, Chiloneourus and Encyrtus—all of which are found on the Lecaniums of the district. No fewer than 41 specimens of an Encyrtid were reared from a single scale of *Kermes pubescens*, an occurrence which seems to indicate that polyembryony exists, at least among some of the Scale parasites: as it seems incredible that 41 eggs would be deposited in a single scale.

Coming to the fungus enemies we find on record several species from various parts of Ontario, only two of which I have found in the vicinity of Guelph. Of these two *Cordyceps clavulata* is by far the more abundant. It is, however, of not much economic value as it does not appear till late in the season—this year it was nearly the end of July. It attacks chiefly *E. cerasifex* but also *Fletcheri* and occasionally *E. caryae*.

The other fungus is known as *Microcera coccophila* and attacks the Curtis Scale—the attacked scales being entirely destroyed. The small red fruiting bodies of this fungus only appear after rain, disappearing again within the space of a few hours after the rain ceases, and consequently, since the spread of this fungus appears to be dependent upon rain, it is not of any great economic importance, at least in this part of Ontario.

"SOME BEETLE HAUNTS," BY AN AMATEUR BOTANIST.

By F. J. A. Morris, Trinity College School, Port Hope.

In my four seasons of collecting, as a coleopterist, there have been three collecting grounds that have most attracted me: (a) Stumps and tree trunks; (b) Blossoms; (c) Foliage. In all three I have found a considerable range of beetle-guests and am able to record rare or interesting finds. It is probable in the second of these three haunts that I have had most success, but it is with the first that I intend chiefly to deal in this paper.

There are two conditions under which stumps make a good collecting-ground; one is when they are dead and dry, but have the bark still covering them; it was this condition that first drew my attention and held it through my first season as a collector. The other condition is when there is yet some life in the wood so that the top of the stump bleeds. I have found that stumps ooze sap in this way for several seasons after the tree has been cut down. A good way to catch beetle-visitors is to scatter some good sized chips or lay a slat or two of wood or bark on the top. Most beetles are active at night, and when there is a shelter of this sort, they take cover there instead of flying away when the sun rises. Easily the best tree for its range of beetle visitors, as well as for total quantity, I have found the basswood; next to that the white pine; then the maple, the birch and the elm. Often when a stump is dry and apparently not in a condition to attract guests it may be made inviting if the bark is still partly green. I have often pried up the bark with a chisel and laid the strips thus removed on the top of the stump; the smell of the sap or juice fermenting has generally lured some prizes to this bait and trap combined.

The season for collecting in this way may be said roughly to extend from the beginning of May to the middle of July. I began collecting in the spring of 1905, but as I went to England at the end of June I did not make much headway that season. In 1906, however, I did a great deal of collecting and gained quite a lot of experience. One of my first finds was

at the beginning of June while prying the bark from a basswood stump. I discovered something like a dozen specimens of *Saperda vestita*, newly hatched and buried in the inner bark of the tree. I had my killing bottle with me, but as the insects were still soft I put them into a small tin box. Here they crawled about excitedly, squeaking (or rather, stridulating) when

Fig. 11. Dicerca divaricata.

Fig. 12. Cicindela sex-guttata.

Fig. 13. Monohammus scutellatus.

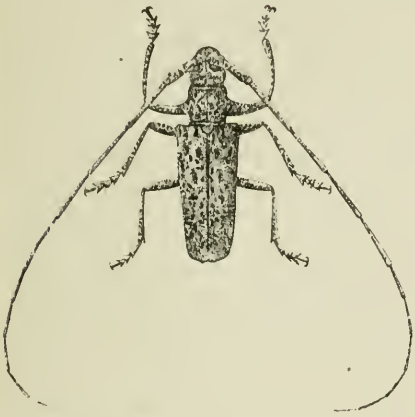

Fig. 14. Monohammus confusor.

Fig. 16. Prionus laticollis.

Fig. 15. Orthosoma brunneum.

handled. On examining them after my return home, I found they had fought in the box, two of them had had their antennae nipped off and several had been deprived of their full complement of legs. I had not yet learned the advantage of laying the detached bits of bark on the stumps as shelter

for nocturnal visitors and so missed a golden opportunity. However, there were a number of basswood stumps in the clearing where I made my first capture and from these I got several more specimens.

About the last day of June in the same season while struggling from a tamarack swamp in which I had found a rare fern (*Botrychium simplex*), I noticed a falling and decaying trunk of elm and on removing some bark I found it infested with a larva closely resembling that of *Saperda vestita;* I took one that appeared nearly full grown, with some of the rotten inner bark, and succeeded in rearing it; some three weeks later it emerged from the pupa as the elm-borer (*Saperda tridentata*). I have taken only one other specimen of this beetle; it settled one fine Sunday night in June on a supper table at which I sat, a guest; the entomologist, however, would not be denied, and in spite of looks of outraged propriety on the part of my fellow guests, and some embarrassment (not mine, but my hostess'), I produced a cyanide bottle and captured the insect.

Early in July I went to Oliver's Ferry, on the Rideau, and in a day or two chanced upon a spot that proved a regular treasure house to the young collector; it was at the side of a path through a wood of young growth, mostly basswood and maple. Here lay a log of basswood with the bark still on it, close by the stump from which it had been cut, and a pile of basswood split and stacked. In the bark of the stump and the log I found larva and pupæ of the *Saperda vestita;* some pupæ that I took home lived and from two or three I secured specimens of the imago. In the hot sunshine beetles lit on the log and on the wood pile, and I tried the experiment of laying detached pieces of bark on the stump, the log, and the split wood; sometimes sandwiching bits of bark between sticks of the wood pile. This simple contrivance of bait and trap yielded splendid results for over a week, at the end of which time the bait was filched by the sun drying all the moisture out. My captures comprised an Elater as large as *Alaus oculatus* and dark pitchy brown in colour; two specimens of a *Chalcophora*, 3 or 4 of *Dicerca divaricata* (Fig. 11), and 15 of a *Chrysobothris* about the size of the apple borer (*Ch. femorata*); a dozen or more of a blackish weevil akin to the strawberry weevil, some two dozen specimens of *Eupsalis minuta*, sexes evenly divided 25 specimens, of *Parandra brunnea*, one specimen of *Tragosoma Harrisii*, and a beautiful specimen of the little *Amphionycha flammata;* this last Dr. Bethune tells me, has seldom, if ever, been reported from Ontario, and it may therefore be interesting to some of you to know that I captured a second specimen of the same beetle about three days later, sunning itself on a leaf of basswood, within 50 yards of the first capture. It was a bright, calm day in July when I captured the first, and very hot with the sun almost at its zenith, and the log on which the insect lit was bathed in sunshine; small as the creature is, the sharp click with which it settled was distinctly audible. As the basswood pile was beginning to fail me, I happened on a clearing where some small maples had been felled. Finding the stumps still moist, I laid chips and bark about their tops. This yielded me several new species—a beetle marked like the *Megalodachne*, but smaller and with the ground-colour light brown instead of dark chestnut; 3 or 4 specimens of a beetle allied to the weevils, I think one of the *Anthribidae;* and, settling on a stump in the sunshine, a magnificent specimen of *Purpuricenus humeralis*, a longicorn of great beauty.

At the end of August I was out fern-hunting at Lake Dalhousie, about 20 miles north of Perth. From a stump of white pine I took the pupæ of a longicorn which later emerged as *Rhagium lineatum*, and while raising some chips from the top of a fresh and resiny stump of white pine I drove

from cover a Clerid that was then new to me; the head and thorax were dull orange, the base of the elytra the same, the rest of the elytra was alternate grey-white and black. Up to that time I had only found two species—a small scarlet one, fairly common, under bark, and one banded with orange and dark blue, which is frequent on certain blossoms. Early next spring, about April the 28th, I found some white pine had been felled in the winter, not many miles from the school in Port Hope. Recollecting my find of the previous autumn, and thinking the fresh resin might be the attraction, I laid some bits of bark and chips on the surface of the stumps. On visiting my traps a day or two later I was agreeably surprised to find 3 specimens of the resin-loving Clerid. About the same time I got 5 more specimens from newly-felled pine, under the chips that had been left on the stump by the axe. Some of these stumps I baited with chips and in all captured about a dozen. I have never found them on dry stumps, but only under fresh chips and associated with new resin. The creature closely resembles a beetle, figured by Curtis in his British Entomology as *Thanasimus formicarius*. It is there said to frequent the Scotch fir, which, of course, is also a pine.

About the middle of May in the same season (1907), I visited the basswood stumps from which the year before I had got the *Saperda vestita*. Some of the bark that I pried up was infested with *Leptura ruficollis*, and I took also from under the bark two pupae of a longicorn closely allied to *Urographis*. Ripping some bark from the sides of several stumps I laid it on the tops. This proved an admirable bait, and among my captures were 3 or 4 specimens of a tiger-beetle (*Cicindela sexguttata*), Fig. 12, 7 specimens of a rove-beetle (*Staphylinus violaceus*), 12 or 14 of the northern Brenthid (*Eupsalis minuta*), a single specimen of a locally rare darkling beetle *Phellopsis obcordata*), 5 Penthes and 6 or 8 *Alaus oculatus*. I may say that I have found the species *oculatus* very common on the basswood, and in one or two cases the beetle, under concealment of the strips of bark, had during part of the night half buried itself in the wood of the stump. The beetle can eat very fast. A friend of mine took 9 or 10 from a rotten basswood log and sent them to me in a stout cardboard box. When I got the parcel, one of the largest specimens had eaten a hole through the corner of the box and was through two folds of the brown paper wrapper. I have never found the allied species of *myops* on basswood but always in white pine, usually under the bark of dead, dry stumps where it is fairly abundant.

Later on in the same season, while wandering about the upper reaches of Gage's Creek, about 6 miles from the school, I passed through a clearing in which hemlock had been felled. Among several other Buprestids settling on the bark of prostrate logs as well as standing trees, were two that were new to me, both very active and only to be caught (unless you had a net) by careful stalking—one a small *Chrysobothris* and the other *Melanophila Drummondi*. This last I had never seen before and have never seen since, but on this newly-felled hemlock, as well as on living trees, it was abundant, and I captured about a dozen specimens. A few days later, at the end of June, I took to the clearing a brother-collector anxious to see *Melanophila Drummondi* in its native haunt, and there I turned him loose. While I was looking about with my eyes focussed for beetles, I distinctly saw a pair of longicorns running on the trunk of a tall elm growing at the foot of the clearing near the stream. From their movements and appearance both I felt sure they were longicorns and at first took them for a pair of *Cyrtophorus verrucosus*, a beetle I am well acquainted with. An instant's reflection told me that at ten yards' distance a beetle the size of *Cyrtophorus* would hardly be visible, and I rushed towards what I was certain must be a prize. Unfor-

tunately the beetles were running in an upward spiral and when I stumbled to the tree over a rotten log they were almost out of reach. I jumped and managed to brush one to the ground, but could not see it by the most careful search. However, I waited patiently for a minute or so, and then to my great delight saw the creature emerge from the ground and re-ascend the trunk. As I captured it I recognized in it the *Physocnemum brevilineum*, a long-coveted species. Scanning the tree carefully I presently descried 2 more of the beetles running about on the bark, some 20 feet up. I stayed for nearly an hour at the foot of the tree, with hope in my heart and a crick in the neck, as intent as a dog listening to the clatter of a squirrel,— and my reward was three or four specimens of the beetle. As a rule, they appeared at a height beyond range, on the trunk of the tree, walking rapidly downwards, following the corrugations and grooves of the bark. Occasionally, however, they lit on the tree after flight through the air, but they rarely, when disturbed, took to the wing for escape, preferring to run or to release their hold and drop. A six mile walk is nothing when a new longicorn is waiting just around the last corner and I made the tree the turning post of my daily course for nearly a week, by which time I had taken 15 or 16 specimens. The tree was apparently sound, with a magnificent crown of foliage surmounting the massive pillar of its trunk, but the beetle was breeding there. I am pretty sure, and in July of this year, while I was in England, my fellow-collector got several more specimens on the same tree.

Early in July I made an expedition to Garden Hill, some ten miles north of Port Hope. Here they were cutting out the pine from a 20-acre lot and a saw mill was at work. I went out in hopes of getting some specimens of *Monohammus*, a beetle that with a single exception I knew only from cabinet collections. The lumbermen said they had seen numbers of these insects on the logs and in the brushwood, but from inexperience, or ill-luck, I failed to secure many; my bag included one pair of the large grey *Monohammus*, 3 isolated specimens of *Monohammus scutellatus* (Fig. 13), and one specimen of a third species of *Monohammus*, the elytra being in colour a mottle of three or four shades of rust yellow, and the insects in size almost identical with *scutellatus*. By preparing several stumps and logs with chips and stripping the bark from dead trees I got several other longicorn beetles, such as *Criocephalus agrestis*, *Orthosoma brunneum* (Fig. 15), *Tragosoma Harrisii*, and a carcase of *Prionus laticollis* (Fig. 16). Had this been all I would have felt some disappointment, but it wasn't. The place was a veritable paradise of Buprestids, and not only did I get 12 or 14 species in all, but among them several quite new to me, beginner as I was. There were at least two (probably three) species of *Chrysobothris*, two of *Chalcophora*, three or four of *Dicerca*, two or three of *Buprestis*, and a black *Melanophila* with a nasty bad habit of settling on the back of one's neck and giving it a sharp nip.

There could be nothing more enjoyable than roaming about in that clearing, and though it is nearly a year and a half ago, it seems like yesterday. It was glorious July weather. In the distance you could hear the Mourning Dove, and round about in the brushwood and trees were several pairs of Towhees and not a few slate-coloured Juncoes. While ranging up and down, I noticed on a bare, dead trunk of pine a bright looking beetle with apparently a damaged wing, for it stood out from the creature's body at an angle. At nearer view this resolved itself into a brand new Clerid, the largest I had ever seen, and in its jaws was the elytron of an *Elater* off which the monster had just been dining; no midnight assassin, but a cannibal in broad daylight, and the rascal was flaunting his trade in one of the gayest liveries you ever

saw; the head and thorax were orange, the shoulders (or base of elytra) black, round the waist a broad sash of brilliant scarlet, below that another band of black, then a band of grey-white, and the tips of the elytra black. In two all-day visits to this place I caught five of these beetles, three of them red-handed—one on a stump with an ant in its jaws, a third on a fence-post dissecting a grub of some kind, the other two belonged to the blameless order of those who have not yet been found out. One was resting on a rail along which a stream of ants happened to be crawling, and the fifth was just issuing from an ant bore in a dead pine, down which motives of curiosity, doubtless as innocent as idle, had prompted it. The same impulse, I think, rather than any misgivings about my intentions, caused it to disappear down an adjoining tunnel, whence my forceps finally extracted it.

In the season just over (1908) I noticed some felled maple and birch on a hillside 7 miles from Port Hope. At the beginning of June I laid chips about two or three of the stump heads; on the fallen trunks I found an immense number of *Chrysobothris breeding*, while under two of my chips on the maple I took two pairs of *Urographis fasciata*, and resting on a stump near by I captured a *Leptura biforis*.

About the middle of June my attention was drawn to some white pine felled in the winter among some woodlands, known locally as Pine Grove. There were about eight trees in all, lying on the ground within a space of about a mile. On the trunks and branches were crawling a number of small dark Clerids with a mark of crimson and two marks of white on each elytron: there was also two sorts of weevil abundant under chips of wood on the ground, and many Buprestids visiting the logs; but in especial, on the trunks, limbs and larger branches there were *Monohammi* breeding. In about six visits I took well over 100 specimens, and my fellow-collector continued to find longicorns up to the 20th of July or later. Our combined captures would amount to 250 beetles. The great majority of these were *Monohammus scutellatus*, of which I took 100, mostly in pairs. I took besides 8 or 10 specimens of the large grey *Monohammus* (whether *titillator* or *confusor*, Fig 14, I am not sure), and four of both sexes of the rust-yellow species. We also got several specimens of a stout grey beetle resembling *Urographis*, but without the extended ovipositor, and a few of a grey species of delicate structure and extremely fine antennae (perhaps *Liopus*). About the middle of July my friend took some 12 specimens of *Leptostylus parvus*. All this on some ten trunks of newly-felled pine.

Our experience raises a question as to the length of time required by the larvæ to mature. There was a tree among these others that had been blown down early in 1907, and was thus in its second season. It was full of holes, most of them quite fresh, from which mature insects had escaped. We could hear larvæ at work during June inside the log, but we did not see any beetles breeding or laying eggs on the bark, as they were doing on all the fresh-fallen trees. Unfortunately, most of these trees have since been removed. I am inclined to think that the dryer the wood is, the longer the larva takes to reach its full growth, and that if the larva hatches in fresh wood it can mature in a single season. I should think this was true of the *scutellatus*, anyway, even if *confusor* and *titillator* require longer. The well-known stories, most of them authentic, about the mature insect escaping from tables and chair legs several years after the manufacture of these articles, would thus illustrate an exceptional state of things in which the larva was confronted prematurely with dry wood to feed on.

Besides these captures on stumps and logs, I have made several by using a similar trap with fungus substituted for bark. But at present I shall

content myself in my closing paragraphs with a few general remarks on the subject of blossoms, as a collecting ground for beetles.

If you refer to any handbook of North American flora, you will find about 130 natural orders of flowering plants. The vast majority of these, however, do not offer their sweets (or pollen, rather) to those browsing cattle among insects, the beetles, whose short jaws and general habit incline them to visit only small shallow blossoms growing in close clusters (racemes) or in flat bunches or heads. Nearly all the blossoms that form a favourite haunt for beetles are included in the series between order 25 and order 50, beginning with the sumach and the vine and ending with the composites. The only important beetle-food outside that series in my experience, is the milkweed and its ally, the dogbane, which come about No. 70 in the natural orders.

If you look a little more closely at the series from 25 to 50, you will find these fall into two distinct groups of eight, separated from each other by a wall of 10 consecutive orders unattractive to beetles.

The first group extends from the poison ivy and the grape vine, through the New Jersey tea and the spiked maple to the great rose family. Of these, the milkwort and the vetch, from the form of their blossoms, are valueless; the poison ivy and the grape vine are fairly good, but the range of their guests is limited. The New Jersey tea is a plant with hardly a rival, both for range of species and for total number of insects. The spiked maple is also a rich storehouse of beetles. In the rose family I have found the hawthorn best, next to it the rose and the bramble, and then the spiræa and the choke cherry.

The second group of eight begins with the umbellifers, and passing through the dogwood and the elder, closes with the great composite family. Of these the bed straw, valerian and teasel, are comparatively worthless; but the dogwood is an excellent host and so are the two species of elder, while several of the composites are worth careful scrutiny.

I shall carry this principle of selection a little farther, by giving a rough outline of a season's beetle collecting from blossoms. The first blossom to open is the early or red-berried elder (*Sambucus pubens*). It varies considerably from season to season, as well as in any one season, owing to differences of location; but about the 10th of May it will be found flowering and its season may last for ten days. It is immediately followed by the hawthorn, which lasts till, perhaps, the 10th of June. By this time the spiked maple and the dogwoods are in flower, and before this last is over comes a riot of blossom, for the late elder and the New Jersey tea both open in the last days of June.

These blossom haunts, then, extend from early in May till the middle of July. The only other conditions of time that need be mentioned are that the pollen on a given blossom must be in a certain state of ripeness or it does not appear to attract beetles at all, and, as a rule, the sun must be shining on the blossoms. If it is hot and calm besides, then you have ideal conditions.

There is, however, an important condition of space to add to these of time. I have, as a beginner, spent hours in fruitless search over whole hedges and thickets of elder and bushes of hawthorn, when ten minutes at a single shrub with only a few meagre blossoms on it would yield a rich harvest. Why? Because the flowers must be growing near a thicket or a wood. If they are in the open, even a hundred yards or so from timber lands, they are almost useless. This is particularly the case when it is longicorns you are on the look-out for. It is, of course, well-known to coleopterists of experience that a clearing or the border of a wood is the best

locality. It is remarked again and again by Bates in his travels on the Amazon, and it is pointed out by Rye and Fowler in their hints to collectors in Great Britain.

In closing I should like to say that by no means the least pleasure to a lover of nature is to observe the marvellous constancy with which season after season these tiny creatures, the offspring of a last year's brood, return to their ancestral haunt, be it blossom or leaf, true to the clock of the year, almost to a day; in obedience to a law there is no gainsaying, and which yet in the creature's serene unconsciousness seems robbed of any touch of harsh compulsion.

TWO ADDITIONS TO THE LIST OF BUTTERFLIES OF THE ISLAND OF MONTREAL.

By Albert F. Winn, Westmount, P. Q.

One of the great attractions of collecting Butterflies and Moths lies in the probability of coming across, at any moment, something new to the locality in which one is working, even though common elsewhere.

Although the district about Montreal has been fairly well worked ever since the formation of the Montreal Branch of the Entomological Society of Ontario, 35 years ago, not a season passes in which we do not find some moths large or small not previously observed and recorded. But finding a new butterfly is a different matter and it was indeed a pleasant surprise when I came across a specimen of the little pepper-and-salt Skipper, *Amblyscirtes samoset*, Scudder, flying over a very muddy field at Pt. aux Trembles, near the rifle ranges on June 7th, and a few minutes later I took another. My companions also wanted some and a thorough search was made, resulting in Mr. Chagnon also capturing one in an adjoining field. The species is apparently commoner to the north among the Laurentian Mountains, where I have taken it at Montfort and St. Faustin, and also at Calumet on the Ottawa River—always in early June.

A month later—July 12th—while walking across the Westmount Golf Links, with Mr. A. R. M. Boulton, of the Quebec Branch, a small yellow butterfly passed us, which looked like a very much undersized *Colias philodice*. My net was not ready, so my companion offered to catch it for me if I wanted it, but as the day was very warm I said not to chase it as it would probably come back, but it kept straight on. We went the opposite way, to the Nun's Woods at Cote St. Luc, to look for *Haploa confusa*, Lyman, and were busy catching a series of these moths, when another of the little yellow butterflies came along. I was ready this time and in a moment secured the first specimen of *Terias lisa*, Bd. and Lec. (the little Sulphur, Holland aptly calls it) that I had seen alive. Another soon appeared in the same place and Mr. Boulton captured it. As we were close to a fine field of clover we thought the butterflies were probably coming from it and therefore turned our attention to it, but without seeing any more. We resumed our raid on the Haploas, going further into the woods where *H. confusa* was scarcer and *H. Lecontei* more likely to be found. We were again lucky, for on coming out of the woods on the west side into a small cedar swamp another *Terias lisa* was flitting about, which I easily caught. As no more were visible we adjourned to Cartierville for lunch.

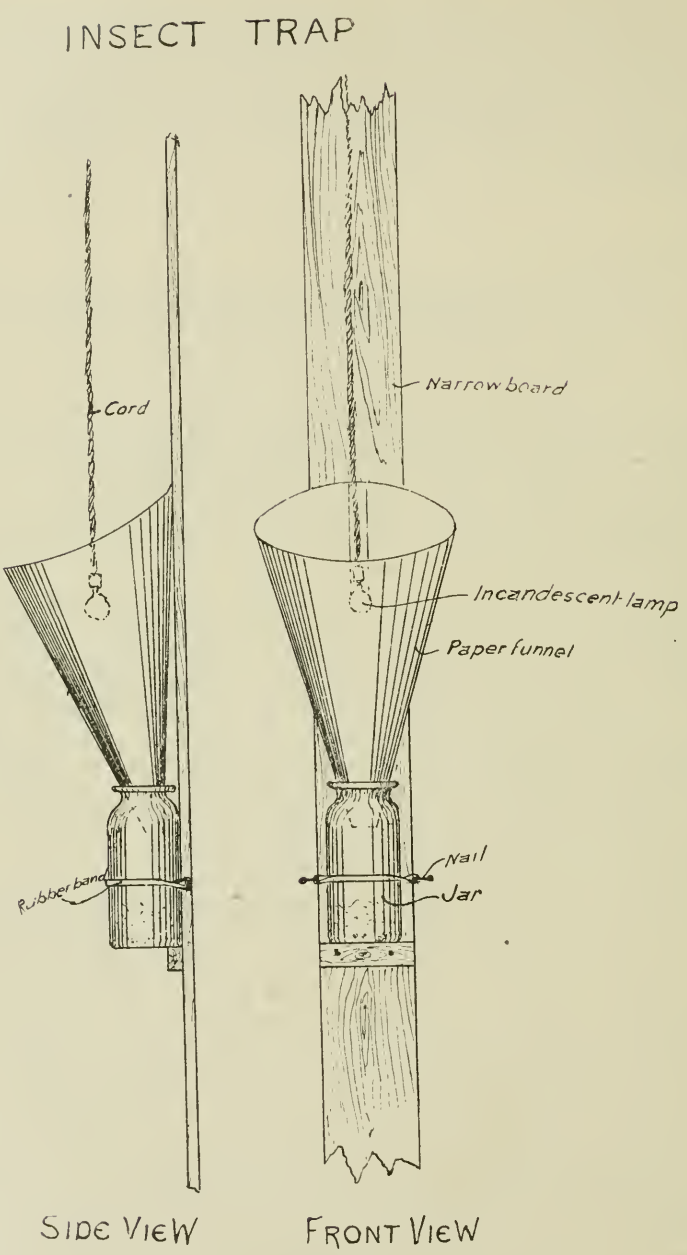
INSECT TRAP
Cord
Rubber band
Narrow board
Incandescent lamp
Paper funnel
Nail
Jar
SIDE VIEW
FRONT VIEW

Fig. 17.

COLLECTING WITH A LANTERN TRAP DURING THE SEASON OF 1908.

By J. D. Evans, Trenton.

The apparatus used during this season consisted of a quart gem jar charged with cyanide of potassium. The jar was prepared in the following manner, lumps of the cyanide of potassium were distributed over the bottom of the jar upon which were placed cork crumbs to the depth of about 1¼ inches—then plaster of Paris formed with water to the consistency of cream poured in to the depth of about 1¼ inches, (although a ½ inch or ¾ inch would have been sufficient.) In all other respects the trap was prepared and set up as described in the Canadian Entomologist for May, 1907. The plaster of Paris gives a better bottom and remains in better condition than the cotton batting filling as there described. This jar remained in good condition for at least three months' service, then getting weak a ⅜ inch hole was bored in the plaster of Paris and lightly stopped with a loose plug of cotton batting and a small quantity of chloroform poured into the hole by the aid of a glass funnel, a charge thus made would last for several nights.

Collecting with the trap was commenced in the first week of June and continued daily uninterruptedly until the end of September, except for a night very occasionally when it was raining—there is no record of these nights during June and July, but perhaps one night in each month would be the limit, but in August the 12th was the only exception and the 28th in September. The 4th September was a very cold night and the trap was not put out.

A daily record of the number of moths taken was not kept during June and July, but frequently the number exceeded 200 and upon one night the number was 434. During August the total number of moths taken was 2,724, the greatest number in any one night being on the 31st, when 220 were taken; the smallest number on the 24th, when 21 were taken. In September the total was 893. The largest catch being on the 5th, 160 moths and the smallest on the 15th and 19th, which were each only 2. These nights being very cool, the 29th and 30th being very cold nights nothing was taken.

Besides the moths, insects of several other orders were taken. Beetles of a considerable number of species, Hymenoptera, Diptera, Hemiptera (principally leaf hoppers of many species), Trichoptera, and Neuroptera. Upon some nights the jar would be almost full of myriads of Phrygania flies, midges, and other insects, and upon one occasion the jar was not only full but the mass extended up some distance into the paper funnel.

One might imagine that the moths would become spoiled with the multitude of occupants, but such is not the case, for many a moth was taken with its scales and fringes in perfect condition, even if in company with large beetles, such as the Lachnosternas.

With the exception of the moths, the captures in the other orders have not yet been named and listed for want of time, but with the moths there have been 281 species listed and a large number yet unnamed more particularly among the Micros.

NOTES ON THE OCCURRENCE OF LACHNOSTERNAS IN 1908.

By J. D. Evans, Trenton.

During the past nearly forty years the writer has collected Coleoptera and paid particular attention to the Lachnosternas, (commonly known as May Beetles or June Bugs), but a dozen or so specimens would be the maximum number taken in any one season and more often the number could readily be counted on the fingers of one hand. *Fusca* was considered the common species, but Dr. J. B. Smith separated and named others in the family or group *fusca* viz. *arcuata, insperata* and *dubia*. Since then it has been found that *fusca* is quite uncommon, the common species being *insperata* and *dubia* and the manner of separating these two species as given by the late Dr. Jno. Hamilton is the presence or absence of a tuft of hair on the head next to and between the eyes, in some specimens this tuft of hair may be much abraded.

The Lachnosternas were very numerous, this season the writer took 168 specimens either at lighted windows or in the trap, of which 91, or more than one-half of the number were *fusca*. The females of *insperata* and *dubia* are quite common, being usually about one-third of the number of the males, but with *fusca* it is very different, for the writer has never seen a female *fusca* among a large series taken at Trenton, Belleville, Sudbury and Ottawa and not until this season when one female only was taken as against 90 males. *Ciliata* is another species a few specimens of which are taken almost yearly, but yet the female has never been seen by the writer.

The number of specimens taken of each of the species throughout the season, being from 17th May to 6th July, is as follows: *Insperata*, 44 males, 10 females; *dubia*, 5 males, 14 females; *fusca*, 90 males, 1 female; *ciliata*, 4 males; total, 168.

In connection with this it might be mentioned that Lachnosternas occurred in large numbers this season at Gardenville and Wellington in Prince Edward County, where they have been very destructive to roots of strawberries, potatoes and other plants and in the imago state both at Trenton and Gardenville they were guilty of stripping off leaves from shrubs, raspberry canes and other fruits.

APPARATUS FOR COLLECTING SMALL ARTHROPODS TERRESTRIAL AND AQUATIC.

By Tennyson D. Jarvis, O. A. College, Guelph.

In the February number of the "Entomological News", Vol. XVII., Dr. L. O. Howard, of the Bureau of Entomology, Washington, described an apparatus, devised by Dr. Berlese, of Florence, Italy, for collecting small Arthropods and in great quantities. Being much interested in the study of Acarids our Department immediately had made an apparatus similar in structure. From it we got excellent results and a short time afterward we devised a machine for collecting aquatic insects and Acarids. We have found both collecting traps highly satisfactory. In the terrestrial trap Arthropods have been taken from many orders, but the largest numbers have been received from the Acarina, Araneida and Thysanura.

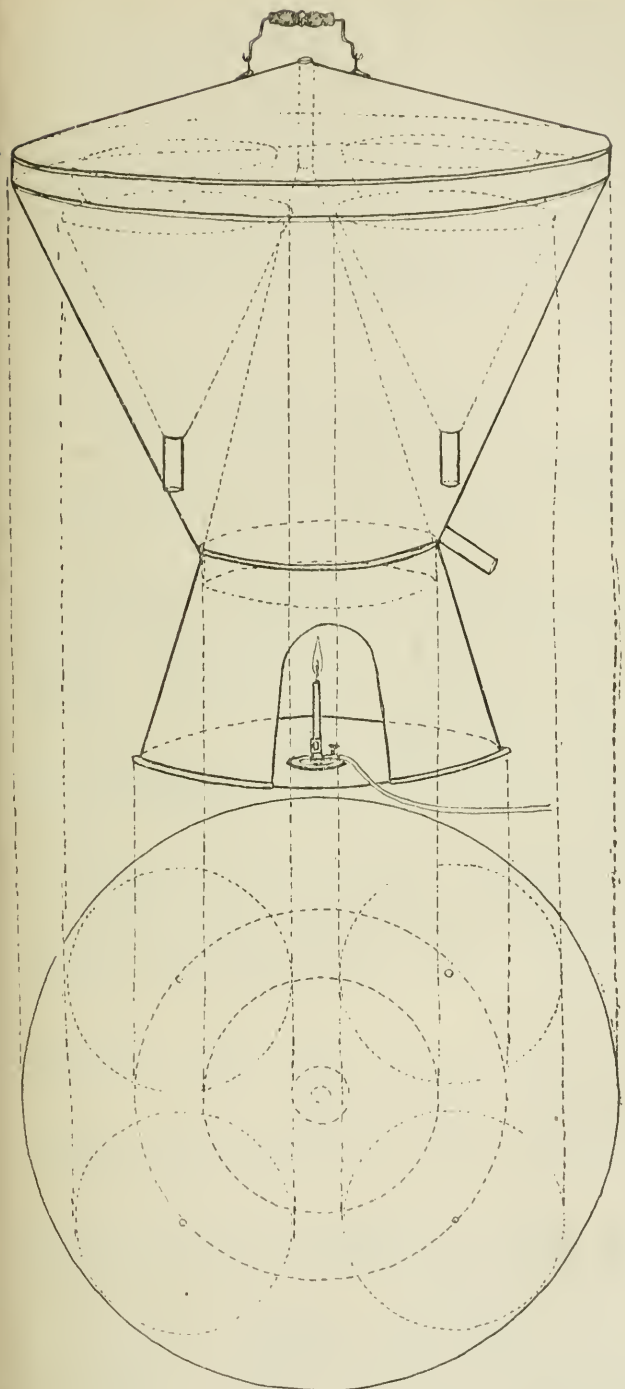

Fig 18. Apparatus for collecting small terrestrial Arthropods.

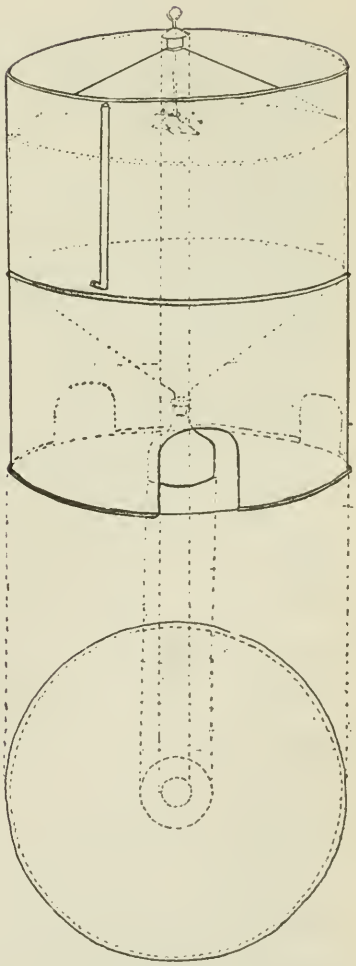

Fig. 19. Apparatus for collecting small aquatic Anthropods.

The terrestrial apparatus is made of copper, lined with tin. It consists of a central cone underneath which heat is applied. Four funnels with smooth tin lining and at the bottom of each is attached a small glass phial which may or may not contain alcohol. The funnels are surrounded by water and the water is kept hot from the gas burner below. On the top of each funnel is placed a shallow or deep tray of metallic network and on them is placed the material to be examined. The water is gradually heated and as the mites become uncomfortably hot they leave their host or other material on which they feed and travel downward into the glass tube below. If the life-history of the mite is desired, they are removed from the bottle and placed on suitable media. If the specimens are to be preserved, the tubes are usually filled with 95 per cent. alcohol or some other suitable preservative. (Figs. 18 and 19.)

A partial list of materials from which mites have been obtained is as follows:

Manure: Mites were obtained from nearly all kinds of manure and were especially abundant in horse and cow manure. From one small lot of horse manure the mites dropped down like a snow storm and filled a 4 cc. phial in a few minutes after the water was heated. Five different species were taken from this one lot.

Bark from Trees: The bark from a host of deciduous and evergreen trees were given a trial on the mite machine, and from nearly every species of tree one or more species of Acarid was taken. Many mites resemble the bark in colour or shape, on which they live, and if it were not for such a device it would mean an endless amount of waste in time and patience. A good example of this is that of a species belonging to the genus Nothrus. This mite in shape and colour resembles bits of bark or lichens.

Ensilage: A large quantity of mites were taken from ensilage from the O. A. College silo. These acarids may be largely responsible for the spread of fungus spores in the silo.

Bone: Some mites were taken from pure bone and others from bone with remnants of flesh adhering to it.

Rock: This is one of the favorite resorts of acarids. Some species evidently live on the sound rock, others on the lichens or decaying organic matter on the rock and still others take refuge in the crevices of rock. Many species were obtained from this source.

Decaying leaves, humus, soil from roots of plants, etc.: Decaying leaves is especially a very favourable resort for acarids, Some live on the decaying matter and others hibernate under the leaves.

Bulbs and Tubers: Here again nearly every kind of bulb and tuber tested yielded one or more species of mite, e.g., Potatoes, Calla Lillies, Hyacinths, Onions, etc.

Fruits: Only a few fruits were tried. The apple is the only one that responded. The mites on the apples were feeding on the wax covering the surface. The King gave the best results.

Roots and Vegetables, etc.: From beets, mangolds, turnips, artichokes, Kohl Rabi, parsnips, squash, mites were obtained.

In root houses and such places the mites carry spores of moulds on their feet and disseminate the fungus.

Moss: A few species were obtained from moss.

Nests: The nests of robins, mice, domestic fowl, were the only ones tried and from each one or more species were obtained.

Vertebrate Animals: Several animals were killed and placed on the sieve and mites were obtained from the following: young mice, mature mice, robins, groundhogs, and muskrats.

Fungi: Only a few specimens were tried. Polyporus and Boletus were infested.

Boards and Sawdust: In this case the mites were probably hiding or hibernating.

Grains: Some of the different kinds of grains that mites were obtained from were: Wheat, barley, corn, oats, mangold seed; whole and ground oats.

Decaying material: Decaying squash, parsnips, potatoes, apples, beets, Kohl Rabi and carrots all yielded mites.

Hay: From Timothy and Clover hay mites were taken.

Cones: One or two species were obtained from Pine cones.

Miscellaneous: Litter from chicken run, grass, road scrapings, living Chickweed, flowers of plants, roots of herbs, granary sweepings, decaying stumps, artichoke stubble, etc.

The aquatic apparatus is made of the same material as the terrestrial one—tin and copper. It works on the same principle as the terrestrial machine, that is when an arthropod becomes uncomfortable it goes up or down to obtain air. The Hexapods usually go up or to the surface of the water and the Arachnids go down, but instead of applying heat a few drops of formalin or alcohol is added to the aquatic material. The trap consists of a central bowl with a metallic sieve above and below. The material to be examined is placed in the bowl and enough water is added to fill the bowl to the level. When the alcohol or formalin is added the aquatic larvae go up to the top of the cone and are pulled out by a little strainer. The Acarids, etc., go down and are caught in a bottle below.

This collecting trap may be taken to a pond or lake and in a short time an immense amount of material can be obtained.

A CATALOGUE OF THE GALL INSECTS OF ONTARIO.

By Tennyson D. Jarvis, O. A. C., Guelph.

The insects which produce galls are confined to the following orders: Acarina, which are not true insects, but mites; the Diptera or flies; the Hemiptera, or bugs; the Lepidoptera, or moths and butterflies; the Coleoptera, or beetles; and the Hymenoptera, or bees, wasps, ants and sawflies.

Their food-plants cover a wide range, some twenty-six orders of plants being affected by them. Some species show a decided preference for certain groups of plants as the following table will show.

—	Acarina.	Diptera.	Hymenoptera.	Hemiptera.	Lepidoptera.	Coleoptera.
Rosaceae	13	14	17	3	.....	1
Cupuliferae	13	5	22	.....	.....	.....
Salicaceae	13	10	5	3	1	1
Urticaceae	5	7	.....	6	.....	.....
Compositae	.....	10	3	1	3	.....
Juglandaceae	2	7	.....	6	.....	.....
Sapindaceae	7	3	.....	.....	.....	.....
Vitaceae	2	5	.....	.....	.....	.....
Tiliaceae	3	2	.....	1	.....	.....
Oleaceae	5	2	.....	.....	.....	.....
Anacardiaceae	2	.....	.....	1	.....	.....
Cornaceae	.....	3	.....	.....	.....	.....
Coniferae	.....	1	.....	1	.....	1
Geraniaceae	.....	2	.....	.....	.....	.....
Gramineae	.....	2	.....	.....	.....	.....
Hamamelideae	.....	.....	.....	2	.....	.....
Labiateae	.....	3	.....	.....	1	.....
Araliaceae	.....	1	.....	.....	.....	.....
Ericaceae	.....	.....	1	.....	.....	.....
Iridaceae	.....	1	.....	.....	.....	.....
Leguminosae	.....	.....	.....	.....	1	.....
Magnoliaceae	.....	1	.....	.....	.....	.....
Rhammaceae	.....	.....	.....	.....	1	.....
Rubiaceae	1	.....	.....	.....	.....	.....
Saxifragaceae	.....	.....	.....	1	.....	.....
Verbenaceae	.....	.....	1	.....	.....	.....
Total	61	77	49	24	7	3

Acarina.

Family—Eriophyidæ. Gall Mites.

This is a family of microscopic mites which are quite curious and unusual in structure. They have only two pairs of legs and the abdomen is long and striated. These striations, which differ in the different species, and differ in number on the dorsal and ventral surfaces are of considerable value in classification. The galls produced vary in form, but are always open or provided with an opening through which the mites pass in and out. They are generally lined with minute hairs (trichomes) which may be simple or branched. The different types of phytoptid galls are shown below, figures 20 to 28.

FIG. 20. Erineum on leaf of beech; natural size and highly magnified.

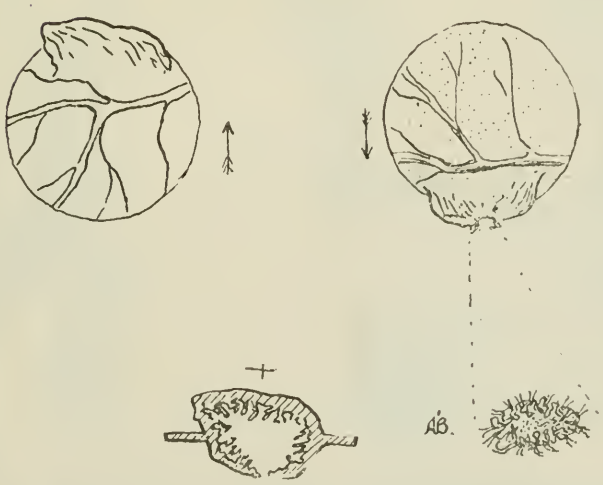

FIG. 21. Capsule Gall: Upper and lower surfaces; interior and opening of capsule, highly magnified.

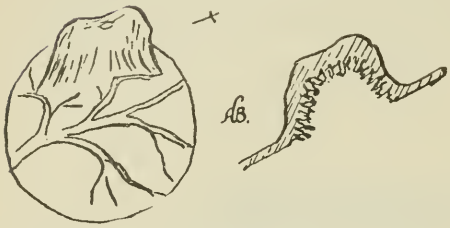

Fig. 22. Dimple Gall and section of interior greatly magnified.

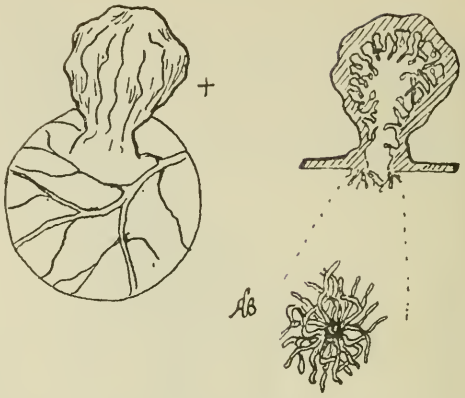

Fig. 23. Pocket Gall : Upper surface of leaf ; interior of gall, much magnified.

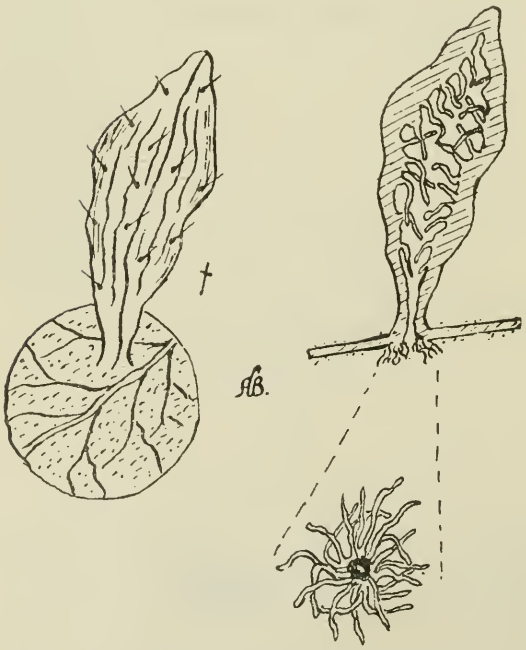

Fig. 24. Pouch Gall on upper surface of leaf ; interior of gall, much magnified.

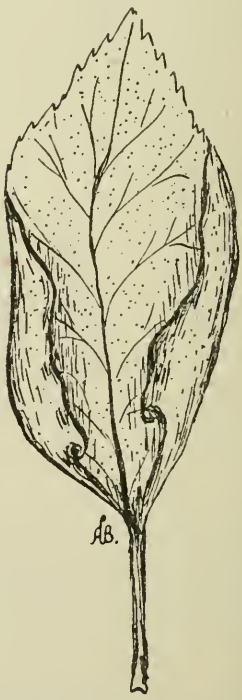

Fig. 25. Leaf-margin Gall.

FIG. 26. Leaf-distortion Gall, different stages.

FIG. 27. Bud-like Galls.

FIG 28. Serpentine Gall.

A simple apparatus, based upon the principle that most insects seek light, provides an efficient and safe method of obtaining parasites from parasitized material, rearing gall insects, etc. Figures 29 and 30.

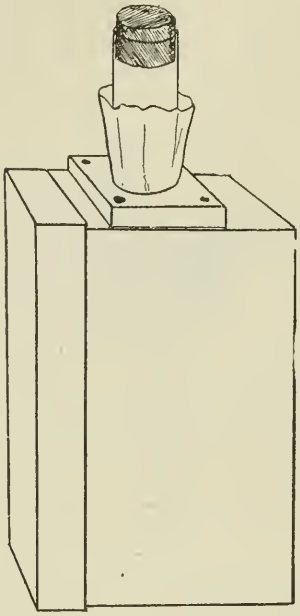

Fig. 29. Apparatus for procuring Parasites. (Side view.)

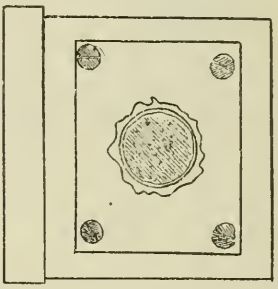

Fig. 30. Apparatus for procuring Parasites. (View from above.)

It consists of a simple cardboard box about 20 x 12 x 12 cm., upon one end of which is fixed by tacks driven through the cardboard from inside, an oblong block of wood about 9 x 7 x 1 cm. with a hole about 2.5 cm. in diameter bored through the centre of it. The cardboard behind this hole is removed neatly leaving a circular hole opening into one end of the box. Into this hole the paper cone, open at both ends, is thrust. A glass tube is thrust into the paper cone. This provides an arrangement which is quite tight and yet easy to handle. The material from which it is desired to obtain insects or parasites is placed in the box. When the insects emerge into the tube it is removed quickly and corked and another tube is put in its place. In case work is being done with very small insects a sheet of cotton cloth covered with a thin layer of cotton batting may be placed over the top of the box and the lid forced down over it, thus preventing the escape of any under the lid. When all the insects which are living have emerged, the material remaining in the boxes may be examined for dead insects.

Coleoptera.

Family-Buprestidæ. Metallic Wood Borers.

A few produce galls, the most important one being the Red-necked Agrilus, producing galls on the Raspberry and Blackberry.

Family-Cerambycidæ. The Long-horned Beetles.

These beetles are of medium or large size. The body is oblong or cylindrical and the antennæ are long, often longer than the body. Only one species of gall maker is known to occur in Ontario; the Willow Branch Borer (*Saperda concolor*).

Family-Curculionidæ. The Curculios or Weevils.

In this family the head is prolonged into a beak which is sometimes longer than the remainder of the body. Specimens of the Red Pine Stem Gall (*Podapion gallicolla*) were received from Mr. A. Cosens, Toronto.

LEPIDOPTERA.

Family-Tortricidæ.

The Tortricids are generally small moths; but as a rule they are larger than the Tineids. *Ecdytolopha insiticiana* is abundant on the Honey Locust and *Eucosma Scudderiana* is common on the Goldenrod.

Family-Tineidæ. The Leaf-miners and Clothes Moths.

The family contains but few gall makers. Species Nepticula occurs on the Aspen and *Stagmatophora ceanothiella* is found at Toronto on New Jersey Tea.

Family-Gelechiidæ.

These are small moths closely related to the Tineids. Two species, belonging to the genus Gnormischema, are abundant on Solidago.

HEMIPTERA.

Family-Aphididæ. Aphids or Plant Lice.

These are small, soft-bodied insects which suck up the juices of plants and which often produce galls. The galls produced vary in form from mere leaf curls to forms of most curious appearance but of quite simple structure. They are all open or furnished with an opening. Twenty-two species of gall producers are recorded for Ontario.

Family-Psyllidæ. Jumping Plant Lice.

The members of this family resemble the preceding to a great extent, but they are not so numerous. The hind legs are formed for jumping. Only two species are so far recorded for Ontario.

DIPTERA.

Family-Cecidomyidæ. Gall Gnats.

These are very delicate, small, two-winged flies with few veins in the wings and with sucking mouth parts. The eggs are laid upon the leaf surface and the larva either feeds there, making an open gall, or makes an incision in the leaf and enters, forming a closed gall, which splits open at maturity at the point where the larva entered. The Larvæ can be readily identified by their color, which is orange, red or pink, and by the development, between the second and third segments of the body, of a peculiar, horny projection called the breast-plate, the use of which is not definitely known. Eleven genera have been recorded for Ontario.

Family-Agromyzidæ.

They are small flies closely related to the Trypetidæ. Only a few are gall makers. One species occurs on Iris and another on Salix.

Family-Trypetidæ.

This family comprises a large number of rather small flies, usually with prettily-marked wings. A few species belonging to the genus Trypeta produce galls on the stems of composites.

HYMENOPTERA.

Family-Tenthredinidæ.

Of this family the Nematinæ produce galls. The head and thorax are wide. The base of the abdomen is broadly joined to the thorax and the abdomen of the female is furnished with a pair of claws. The larvæ have from twelve to sixteen prolegs. These insects have been very thoroughly taken up by Norton in his monograph on the Nematinæ. A large number make galls on Willow.

Family-Cynipidæ. Gall Flies.

This is a family of very minute, four winged insects. In the adult gall-fly the abdomen is unusually compressed and joined to the thorax by a short peduncle, the first abdominal segment. The ovipositor is long and slender. The insect deposits its eggs within the tissues of the plant by piercing it with its ovipositor. The galls produced are closed and the insect emerges at maturity through a hole it cuts in the gall.

The writer's thanks should be here expressed to those who have so kindly assisted in the preparation of this paper. I am under special obligation to Prof. Bethune, O.A.C., Guelph; Dr. E. Porter Felt, State Entomologist, N.Y.; Mr. A. Cosens, Toronto, and Mr. W. R. Thompson, Guelph, and Mr. C. D. Jarvis, Storrs, Conn.

The present list is arranged alphabetically by host plants.

AFFECTING ALDER.

A white, frost-like erineum on under side of leaf in the axils of the veins. Trichomes dense, pellucid.—*Eriophyes* sp.—Alnus incana.

A small, red or green pubescent pocket gall on leaf. Alder Pocket Gall—*Eriophyes* sp.—Alnus incana.

A rounded gall, a deformation of the terminal bud. Alder Bud Gall.—*Dasyneura serrulatæ*—O.S. Alnus incana.

AFFECTING ASH.

Spherical, pulpy green galls about the size of a pea, springing from the upper surface of the midribs or veins. Ash Ball Gall—*Cecidomyiadæ*—Fraxinus sambucifolia.

Elongated, green, succulent galls on the under side of the leaf. Ash Midrib Gall—*Cecidomyia pellex*—O.S. Plate F., fig. 5. Fraxinus americana.

Small, irregular, smooth, more or less spherical capsule gall, protruding on both sides of the leaf. Ash Mite Gall—*Eriophyes fraxini*—Garman, Fraxinus americana.

Pinkish white, elongated capsule galls on the veins of the leaf. Ventrally the galls appear as white, hairy projections following the veins. Ash Vein Gall—*Eriophyes* sp.

A deformation of the terminal buds, their development arrested, producing a mass of small twisted leaf ends. *Eriophyes* sp.—Fraxinus americana.

Leaves dwarfed and distorted in a bundle. Resembles somewhat Cecidomyia solidaginis. Ash Bunch Gall—*Eriophyes* sp. Plate L., fig. 2. Fraxinus americana.

Small, irregular, more or less spherical capsule gall protruding on both sides of leaf. Galls hairy—*Eriophyes* sp. Fraxinus pubescens.

Affecting Barley.

A small gall forming a woody growth which fills up the cavity of the stalk and causes the joints to swell. Barley Joint-Worm Gall—*Isosoma hordei* (Harris). Hordeum vulgare.

Affecting Basswood.

A.—*Galls on the leaves.*

Balloon-shaped galls on the upper surface of the leaf Apex of gall usually serrated. Basswood Balloon Gall—*Eriophyes abnormis* Garman—Plate I., fig. 6. Tilia americana.

Irregular, circular, dark reddish-brown spots about 4-5 mm. in diameter, having in their centre very characteristic tufts of whitish hairs. Basswood Tufted Gall. Tilia americana.

A white erineum or shallow dimple on underside of leaf, much like the Erineum on Acer negundo. *Eriophyes* sp.—Plate M., fig. 4. Tilia europea.

Small swellings about 3 mm. in diameter, protruding from both sides of the leaf. Red above and green below. Basswood Wart Gall—*Cecidomyia verrucicola*, O.S. Tilia americana.

B.—*Galls on Stem.*

Oval swellings of the cortex about 1 cm. long. Texture pith-like, surface smooth and of the same color and appearance as the bark. Basswood Egg Gall. Tilia americana.

Affecting Bearberry.

Red galls about 10 mm. long and 4. mm. broad, upon the leaves. Resulting from the folding over of the edge of the leaf or sometimes both edges, forming a pocket. Bearberry Leaf Gall—*Pemphigus Coweni* (Ckl.)—Arctostaphylos uva-ursi.

Affecting Beech.

A frosty, white erineum in large patches on the under side of the leaf. Trichomes spherically capitate. *Eriophyes* sp.—Plate H., fig. 4. Fagus americana.

Affecting Blue Beech.

Fold of the leaf along the veins forming a long hollow tube. Vein Gall of Blue Beech—*Cecidomyia pudibunda*—O.S. Plate E., fig. 6. Carpinus caroliniana.

Affecting Birch.

A bud deformation, crowded and irregular, often in bunches of large size. Birch Bud Gall—*Eriophyes* sp.—Plate G., fig. 6. Betula lutea.

A rosy pink erineum in large patches on the upper side of the leaf. *Eriophyes* sp.—Betula lenta.

A yellowish-white to brownish erineum forming large patches between the ribs on the under side of the leaf. *Eriophyes* sp.—Betula papyrifera.

A transparently white, granular erineum on the surface of the leaves—*Eriophyes* sp.—Betula pumila.

A capsule gall, very small, yellow to brown. Paper Birch Capsule Gall—*Eriophyes* sp.—Plate M., fig. 5. Betula papyrifera.

A nodular pocket gall, occuring upon both faces of the leaf; yellowish or reddish to purplish. Paper Birch Pocket Gall—*Eriophyes* sp.—Plate K., fig. 1. Betula papyrifera.

Affecting Blue Flag.

An oval enlargement on the inside of the leaf, usually about 1 inch from the tip. Iris Leaf Gall—*Agromyza magnicornis* (Lowe)—Iris versicolor.

Affecting Boneset.

Oval swellings on the stems and leaf stalks. Boneset Stem Gall—*Choristoneura perfoliatum* (Felt)—Plate A., fig. 5. Eupatorium perfoliatum.

Affecting Bramble.

A.—*Galls on leaves.*

Irregular-shaped, woody swellings at the base of the leaflets, or on the midrib of the Blackberry. Wood Leaf Gall—*Lasioptera farinosa* (Wm. Beutm)—Rubus villosus.

Irregular sub-conical stem galls about three-quarters of an inch in length. Blackberry Stem Gall—*Lasioptera nodulosa* (Beutm)—Rubus villosus.

B.—*Galls on stem.*

A mass of hard, small cells covered with a dense thick mass of green filaments clustered around a branch or twig of Blackberry. From 1.5 to 2 cm. in diameter. Mossy Rose Gall—Rhodites rosæ (Linn)—Plate B., fig. 1. Rubus villosus.

Large, oblong, polythalamous stem gall, 1 to 3 inches in length. Surface uneven with deep longitudinal furrows which divide the gall, more or less completely, into 4 or 5 portions. Pithy Blackberry Gall—*Diastrophus nebulosus*, O.S.—Rubus villosus.

Symmetrical swellings of the Blackberry cane. Gouty Gall *Agrilus ruficollis* (Fab.)—Rubus villosus.

Hard woody, somewhat globular, seed-like bodies 2 to 4 mm. in diameter formed in clusters on the stem. More or less covered with curved spines which are about 2 mm. long. Blackberry Seed Gall—*Diastrophus cuscutæformis* (O.S.)—Rubus villosus.

Large, reddish-brown, polythalamous, tubercular or irregular gall about 1 to 1.75 inches long and .5 inches in diameter, arising abruptly on the stem. Green in summer, darkening towards winter. Raspberry Stem Gall—*Diastrophus turgidus* (Bass)—Plate B., fig. 2. Rubus strigosus.

Affecting Bugleweed.

An elliptical or sometimes almost spherical gall formed on the stem. Bugleweed Stem Gall—*Lasioptera lycopi* (Felt)—Plate N., fig. 5. Lycopus virginicus.

Affecting Buttonbush.

Clusters of small dimples on the upper side of the leaf, 1 to 3 mm. high. Buttonbush Dimple Gall—*Eriophyes cephalanthe* (Cook)—Plate K., fig. 5. Cephalanthus occidentalis.

Affecting Chestnut.

A small capsule gall, on the leaf, more or less spherical and 2-3 mm. in diameter. Chestnut Capsule Gall—*Eriophyes* sp.—Castanea sativa, var. americana.

Affecting Cinquefoil.

Oval or spherical galls from $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, arising in the axil of the leaves. Cinquefoil Axil Gall—*Diastrophus potentillæ* (Bass)—Plate B., fig. 5. Potentilla Canadensis.

Oval or cylindrical swellings from 1 to 2 inches long on the stems usually near the base of the plant, Monothalamous. Cinquefoil Stem Gall. Potentilla norvegica.

Affecting Currant.

Red or purple elevations or folds on the upper side of the leaf. Currant Leaf Gall—*Myzus ribis*, Linn—Ribes rubrum.

Affecting Dandelion.

Irregular, knotty, pithy swellings, forming oblong irregular galls along and surrounding the leaf-petiole; average length from one-quarter of an inch to fully two inches. Dandelion Petiole Gall—*Gilletia Taraxaci*, Ashmead—Taraxacum officinale.

Affecting Dogwood.

Club-shaped and about $\frac{1}{2}$ to 1 inch long. On terminal twigs. Dogwood Club Gall—*Cecidomyia clavula* (Beutm.)—Cornus florida.

Thin-walled circular elevations on the under side of the leaves. Dogwood Leaf Gall—*Lasioptera corni* (Felt)—Plate A., fig. 2. Cornus florida.

Small, nearly oval Gall situated on the petiole of the leaf. Flowering Dogwood Petiole Gall. Cornus florida.

Affecting Elm.

A.—*Galls on the leaves.*

Round dimples in the backs of the leaves resulting in small elevations on the upper side. About 2 mm. in diameter and surrounded by an areola of lighter green. In the cavity of the gall rests a small, white larva covered with a viscid, transparent secretion. Pimple Gall—*Cecidomyiadæ*—Plate P., fig. 4. Showing larva and gall.

Ulmus americana.

A leafy growth arising from a bud and resembling the Pine Cone Willow gall but more nearly spherical and only about $\frac{1}{2}$ an inch in diameter. Remains green during summer but changes to a dark brown in winter. Red Elm Bud-Gall—Plate P., fig. 6. Ulmus pubescens.

A green plum-like structure on the upper surface of the leaf. About 10 to 12 mm. in length and 3 to 7 mm. in thickness. Plum Gall—*Pemphigus ulmi fuscus*—Ulmus campestris.

There is a similar gall on Red Elm, but differing in the following respects: (1) It is twice as large. (2) The wall is a little thicker. (3) The

surface is rough like the leaf not glossy. (4) The part of the leaf around the base is quite normal in appearance, showing no signs of being weakened through lack of nourishment. Ulmus pubescens.—Plate C., fig. 8.

Hollow, cock's comb-like, thin walled gall; on the upper surface of the leaf. Cockscomb Gall—*Colopha ulmicola* (Fitch)—Plate I., fig. 5. Ulmus americana.

A pulpy thickening of the tissues on the under surface of the leaf, extending for some distance along the midrib. Causes the upper surface to double on itself instead of expanding in the ordinary way. Leaf Fold Gall—*Cecidomyia ulmi* (Beutm)—Plate A., fig. 1. Ulmus americana.

Curling and gnarling of the leaves forming thereby a sort of pseudo-gall. Woolly Aphid Leaf Gall—*Schizoneura americana* (Riley)—Plate Q., fig. 1. Ulmus racemosa.

B.—*Galls on the stems.*

Aphids clustering on the limbs and trunks, causing a knotty unnatural growth of the wood. Woolly Aphid Stem-gall—*Schizoneura Rileyi* (Thomas). Ulmus americana.

Small green to yellowish pocket-galls, more or less spherical, usually on the upper side of the leaves. Elm Pocket Gall—*Eriophyes ulmi* (Garman)—Plate H., fig. 5 and 6. Ulmus americana and U. Racemosa.

An erineum on the under side of the leaf; white at first changing to brown. Trichomes simple, tangled. Rock Elm Erineum Gall—*Eriophyes* sp.—Plate H., fig. 3. Ulmus racemosa.

A very large pouch-gall on the leaves, commencing as a cone or deep dimple. *Eriophyes* sp.—Plate L., fig. 6. Ulmus pubescens.

A cone-shaped pouch gall resembling those on Tilia and much larger than Eriophyes ulmi. On the upper surface of the leaf, often very many on a single leaf but thickest along the midrib usually; shape irregular but usually tapering towards both ends and twice as long as thick, average length being about 5 mm., and average thickness about 2-2.5 mm.; color green. *Eriophyes* sp.—Plate L., fig. 5. Ulmus americana.

Affecting Evergreens.

Irregularly oblong gall, situated near the base of the needle on the new growth. Balsam Fir Needle-gall—*Cecidomyia balsamicola* (Lintner)—Plate A., fig. 3. Abies balsamea.

Oval swellings on the twigs of various species of Spruce. Spruce Gall louse—*Chermes abietis*—Picea nigra, P. excelsa and P. alba.

The gall consists of an enlargement of the smaller branches. Red Pine Stem Gall—*Podapion gallicolla* (Riley)—Pinus resinosa

Affecting False Nettle.

An elongate, fusiform swelling of the stalk. False Nettle Stem Gall—*Cecidomyia* (?) *bœhmeriæ* (Beutm)—Bœhmeria cylindrica.

Affecting Ginseng.

Spherical or irregularly cylindrical, brown galls upon the roots. Ginseng Root Gall. Aralia nudicaulis.

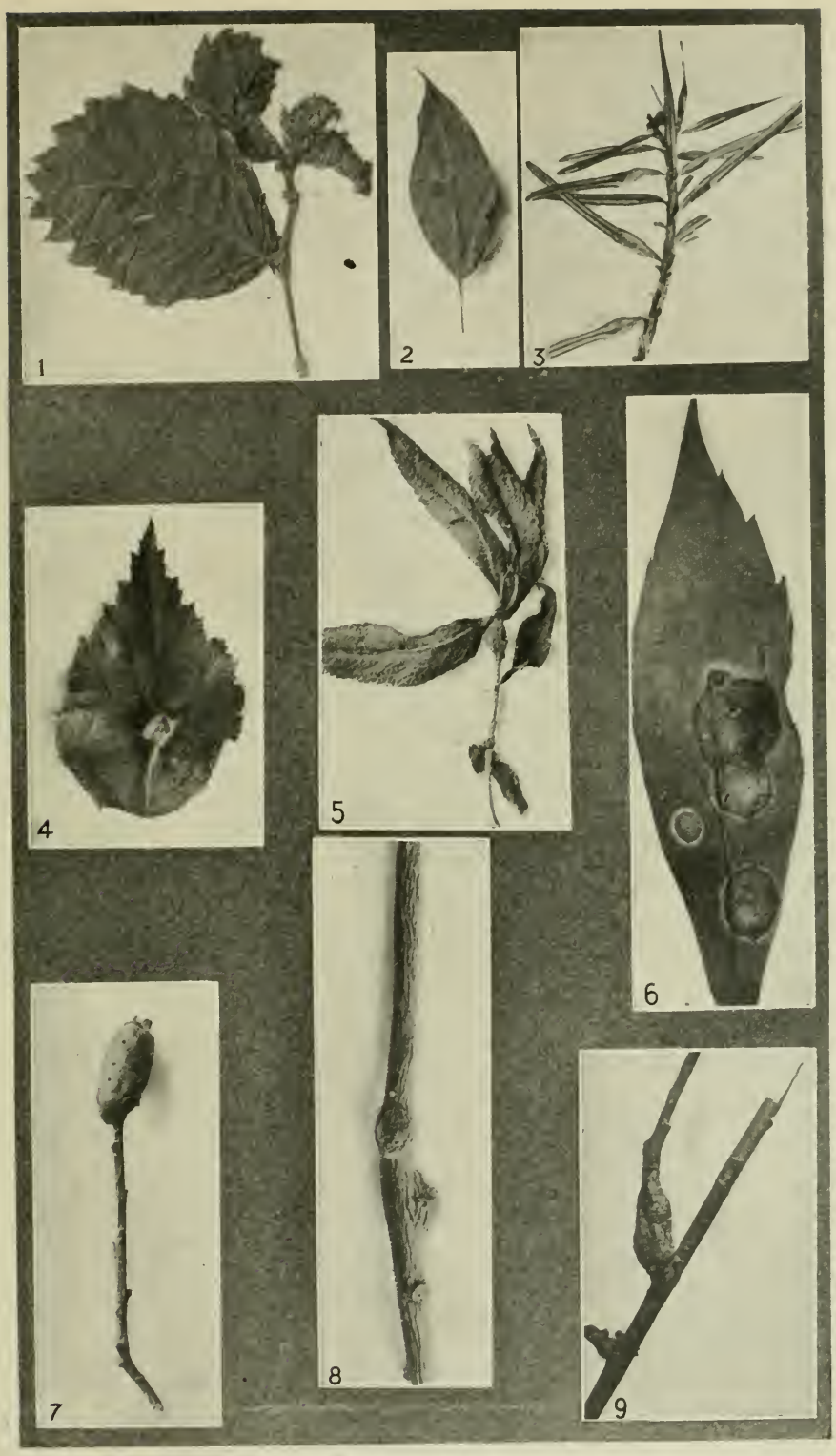

PLATE A.

1. Cecidomyia ulmi Beuten.
2. Lasioptera corni, Felt.
3. Cecidomyia balsamifera, Lintner.
4. Hormomyia cratægifolia, Felt.
5. Choristoneura perfoliata, Felt.
6. Choristoneura flavolunata, Felt.
7. Rhabdophaga batatas, O.S.
8. Agromyza æneiventris, Fallen.
9. Rhabdophaga nodulus, Walsh.

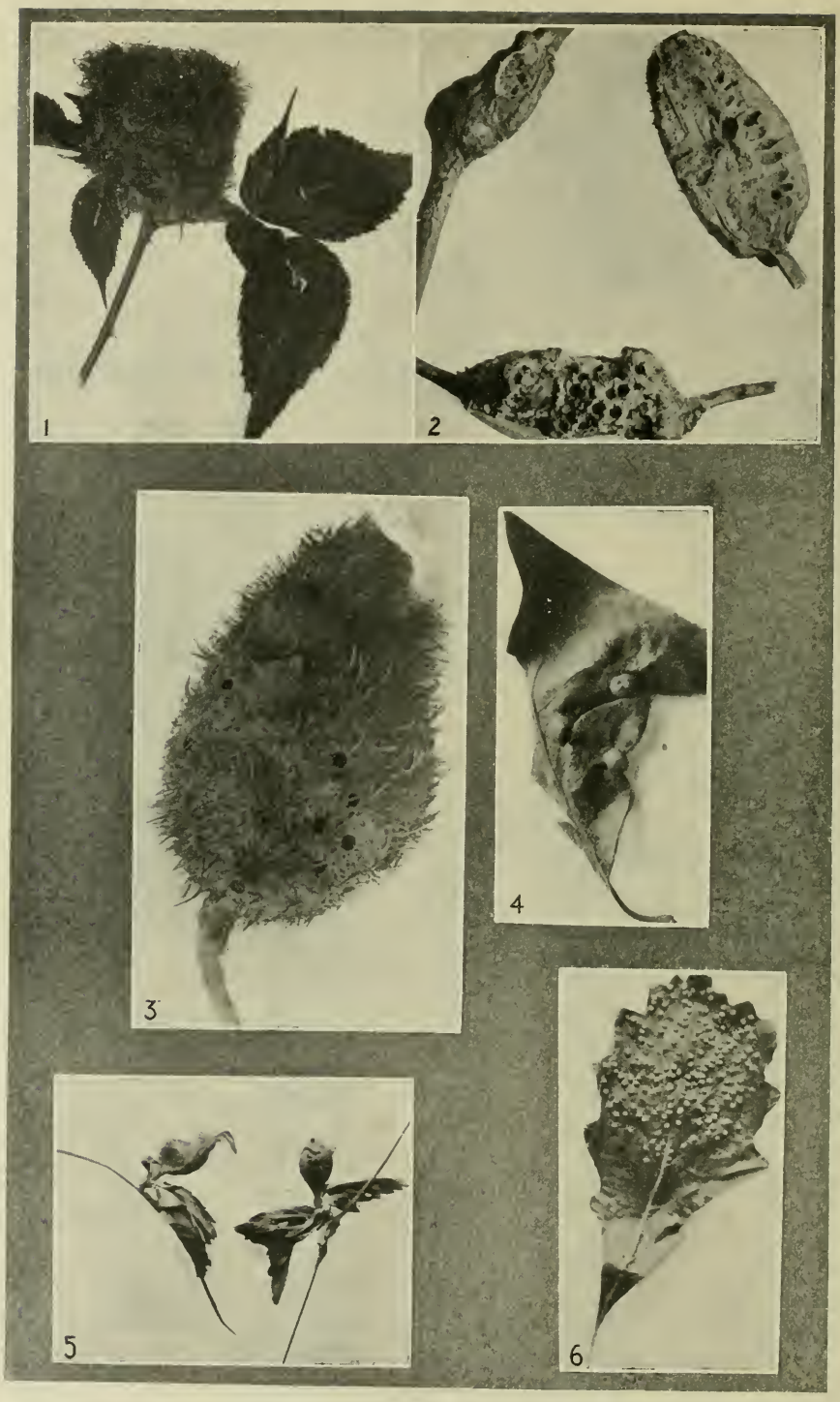

PLATE B.

1. Rhodites rosae, Linn. on Blackberry.
2. Diastrophus turgidus, Bass.
3. Rhodites multispinosus, Gill.
4. Andricus futilis, O. S.
5. Diastrophus potentillæ, Bass.
6. Neuroterus umbilicatus, Bass.

PLATE C.

1. Andricus punctatus, Bass.
2. Biorhiza forticornis, Walsh.
3. Andricus clavula, Bass.
4. Cynips strobilana, O.S.
5. Andricus papillatus, O.S.
6. Andricus topiarius, Ashm.
7. Eucosma scudderiana, Clem.
8. Pemphigus ulmi-fuscus.

PLATE D.

1. Eriophyes sp., Amelanchier Canadensis.
2. Eriophyes sp., Juglans nigra.
3. Eriophyes sp., Populus italica.
4. Eriophyes sp., Vitis cordifolia.
5. Eriophyes sp., Salix fragilis.

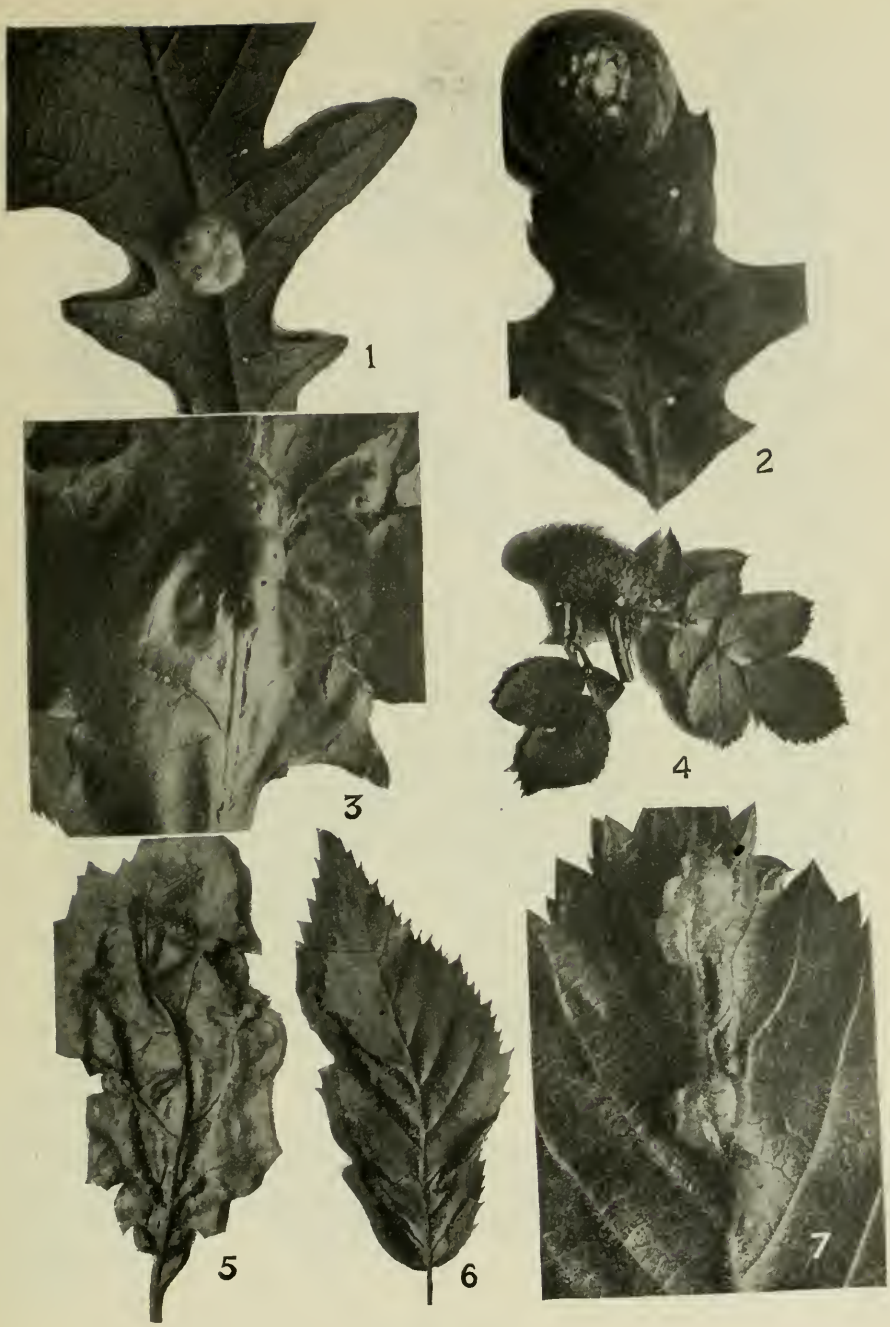

PLATE E.

1. Furry Ball Gall on Oak. (*Andricus lana.*)
2. The Larger Oak-Apple. (*Amphibolips confluentis.*)
3. Oak Midrib Gall. (*Andricus piger.*)
4. Mossy Rose Gall. (*Rhodites rosae.*)
5. Vein Gall on Oak. (*Cecidomyia quercus-majalis.*)
6. Vein Gall on Blue Beech. (*Cecidomyia pudibunda.*)
7. Virginian Creeper Midrib Gall. (*Cecidomyia sp.*)

PLATE F.

1. Ball Gall on Hickory. (*Diplosis caryae.*)
2. Spiny Ball Gall on Wild Rose. (*Rhodites nebulosus.*)
3. Ball Gall on Wood Nettle. (*Cecidomyia urnicola.*)
4. Rose Stem Gall. (*Rhodites globulus.*)
5. Ash Gall. *Cecidomyia pellex.*)
6. Eye Spot Gall of Maple. (*Cecidomyia ocellata.*)

PLATE G.

1. Vein Gall on White Ash. *Eriophyes sp.*
2. Chokecherry Mite Gall. *Eriophyes. sp.*
3. Hawthorn Serpentine Gall. *Eriophyes sp.*
4. Manitoba Maple Wart Gall. *Eriophyes sp.*
5. Poison Ivy Mite Gall. *Eriophyes sp.*
6. Birch Bud-Gall. *Eriophyes sp.*

PLATE H.

1. Sugar Maple Pink frost-gall. *Eriophyes sp.*
2. Mountain Maple frost-gall. *Eriophyes sp.*
3. Rock Elm frost-gall. *Eriophyes sp.*
4. Beech frost-gall. *Eriophyes sp.*
5. Elm mite gall. *Eriophyes ulmi.*
6. Elm mite gall. Enlarged opening on under surface.

Affecting Goldenrod.

A.—*Galls on leaves.*

Circular or somewhat irregularly elliptical, spot-like galls, only projecting very slightly from each side of the leaf. The main part of the spot is light colored, this being enclosed by a dark ring giving it some resemblance to an eye. Lunate Marginal Gall—*Choristoneura flavolunata* (Felt)—Plate A., fig. 6. Solidago Canadensis.

Small, oblong, or seed-like galls, light green in color, on the lower surface of the leaves. Seed Gall. Solidago Canadensis.

Conical leafy structure ½ to 1½ inches high and ½ inch in diameter. Between the thickened parts of the leaflets live from one to many, small, orange coloured larvæ. Terminal Gall—*Asphondylia monacha* (O.S.)—Solidago Canadensis.

Leaves thickened and folded lengthwise, somewhat like a pod; green or red in colour. Leaf-fold Gall—*Chaitophorous* sp. (undescribed)—Solidago Canadensis.

B.—*Galls on the stems.*

Large, elongated, monothalamous gall with a very large larval chamber situated on the stem below the branches. Elliptical Gall—*Gnorimoschema, gallæsolidaginis* (Riley).

Spindle-shaped galls about 3 cm. in length. Situated high up on the stem on the main axis of the plant among the branches, often causing some of these to abort. It passes the winter in the larval stage. Goldenrod Spindle Gall—*Eucosma Scudderiana* (Clemens)—Plate J., fig. 2. Solidago Canadensis.

Elliptical, hollow gall, 1.25 inches in length, .48 of an inch in diameter, the diameter of the plug .08 of an inch. The galls are found a short distance above the ground.—Gnormischema gallæisterella (Kell). Solidago Canadensis.

Apical, bunch-like galls produced by the arrest of growth in the stalk, which causes the leaves to accumulate. Bunch Gall—*Cecidomyia solidaginis* (Loew)—Solidago Canadensis.

Globular, ball-like enlargement about 1 inch in diameter. Ball Gall—*Trypeta solidaginis* (Fitch)—Plate J., fig. 3. Solidago Canadensis.

Consists of small bunch of accumulated aborted leaves about ½ inch in length. Cylindrical Bunch Gall—*Trypeta polita* (Loew)—Solidago Canadensis.

C.—*Galls in flower stalk.*

Bud-shaped, green galls, which are larger and stouter than the normal buds. Bud Gall—*Cecidomyia racemicola* (O.S.)—Solidago Canadensis.

Affecting Gooseberry.

An irregular or rounded cluster of bud-like galls arising from a spherical receptacle on the stem. Gooseberry Bud Gall. Plate O., fig. 6. *Ribes cynosbati.*

Affecting Grape.

A.—*Galls on leaves.*

A white erineum on the underside of the leaf. Trichomes simple. *Eriophyes sp.*—Plate L., fig. 4. Wild Grape.

Small, semi-circular or nearly circular capsules along the veins, about 2 mm. in diameter and but slightly elevated on either surface of the leaf. On

upper surface paler than the leaf, below, with a white nipple surrounded by a furrow. *Eriophyes* sp.—Vitis cordifolia.

Small, rough galls usually on the upper surface of the leaf. The galls are very numerous, and frequently the leaves are absolutely covered with them. Grape phylloxera—*Phylloxera vastatrix* (Planchon)—Vitis sp.

Elongated, conical, red galls, .7-1 cm. in length usually on the upper side of the leaves. Grape Vine Tube Gall—*Cecidomyia viticola* (O.S.)—Plate O., fig. 1. Vitis sp.

Irregular, soft and succulent swellings on stems and leaf-stalks of Grapes; yellow green or red in color. Grape-vine Tomato Gall—*Lasioptera vitis* (O.S.)—Vitis sp.

Oval, red swellings of the petiole. About $\frac{1}{2}$ inch long and $\frac{1}{4}$ of an inch in diameter. Grape Petiole Gall—Vitis cordifolia.

B.—*Galls on Stems.*

Rounded galls flattened at the base and jointed at the top. On the stems of Wild Grapes. Grape-vine Apple Gall—*Cecidomyia vitis-pomum* (Walsh & Riley).

Affecting Hackberry.

A witch-broom gall on branches and twigs. Hackberry Witch-broom Gall—*Eriophyes* sp.—Celtis occidentalis.

A woody gall with bluntly-rounded apex and slightly constricted at the point of attachment to the leaf. Opposite the gall is a concave depression. Hackberry Nipple Gall—*Pachypsylla celtidis-mammæ* (Riley)—Celtis occidentalis.

Circular spot-like gall on the under side of the leaf with a small nipple in the middle. Hackberry Blister Gall—*Pachypsylla celtidis-vesiculum* (Riley)—Celtis occidentalis.

Affecting Hawthorn.

A fold of the leaf making long, irregular, wavy projections on the upper surface of the leaf. From the midrib to the edge of the leaf is the general direction of the gall. Serpentine Gall—*Acarus cratægi vermiculus*—Plate G., fig. 3. Cratægus sp.

Small, round swellings (capsules) protruding very slightly on both sides of the leaf. About .5-1 mm. in diameter. Galls very numerous where they occur—sometimes more than 100 on a single leaf. Speck Gall—*Eriophyes* sp.—Cratægus sp.

These tiny oval galls can be easily recognized from their peculiar habit of arranging themselves all around the margins of the leaf, thus forming a sort of border for it. They are often so numerous that there is one for each serration. Each gall is about 2 mm. long, 1 mm. wide, and about 5 mm. thick. It extends about equally beyond both surfaces of the leaf and is of much the same texture as the leaf itself, except that towards the apex both it and the apex of the serration on which it is situated tend to become brown. In this brown part there is a small aperture. The gall is monothalamous, and contains a single, yellowish white, short, fat larva, which on July 31st had not yet begun to pupate. Hawthorn Leaf-border Gall—Plate N., fig. 7. Cratægus sp.

Small red, pod-shaped structures slightly tapering towards one end on the upper surface of the leaf. From 5-8 mm. long and about 2 mm. wide. Pod Gall—*Cecidomyidæ*—Cratægus sp.

Tiny, oval structures arranged around the margin of the leaf. Often so numerous that there is one for each serration. Leaf-border-Gall *Cecidomyia* Cratægus sp.

Green or pink, globular, bladder-like structures on the under surface of the leaf. About 5 mm. in diameter. Bladder Gall—*Cecidomyidæ*—Plate O., fig. 5. Cratægus sp.

Very small, monothalamous, conical structures, 1 to 2 mm. high and 1,1.5 mm. wide at the base; formed anywhere on either surface of the leaf and sometimes on the stem of young twigs. Cone Gall —*Eriophyes*—Cratægus sp.

Cylindrical structures, hollow, red or green in color, about 3 mm. in height and diameter and with a hole in the top. Top of gall thickly set with spines. Burr Gall—*Cecidomyia bedeguar*, O.S.—Plate O., fig. 3. Cratægus sp.

Cock's comb-like structure on the upper surface of the leaf. Cock's Comb Hawthorn Gall—*Hormomyia cratægifolia* (Felt)—Plate A., fig. 4. Cratægus sp.

Leaf slightly thickened, purplish in color and rolled in upon itself, the under surface being the one enclosed. Wooly Aphid Gall (*Schizoneura*)—Cratægus sp.

Affecting Helianthus.

Globular gall about ½ an inch in diameter on the leaves. Helianthus Ball Gall—*Cecidomyia bulla* (Walsh)—Helianthus divaricatus and H. Strimosus.

Linear-shaped galls in clusters on the stem. *Cecidomyia helianthi* (Brodie)—Helianthus divaricatus and H. strimosus.

Affecting Hazel.

This gall is found only along the main veins of the leaf. The part of the leaf round the affected portion of the vein become crimped, the crimps all radiating towards the vein as a common centre. Hazel Leaf Crimp Gall (Undescribed)—Corylus americana.

A bud deformation, which attacks bud as soon as it expands, and checks its subsequent development. Hazelnut Bud Gall—*Eriophyes avellanæ*—Corylus americana.

Affecting Hickory

A.—*Galls on leaves.*

Flattened, circular, yellow or whitish galls, an inch in diameter. Hickory Button Gall—*Phylloxera fovela*—Plate N., fig.1. Carya glabra.

Red, elongated galls, consisting of a fold of the main veins running from the midrib to the edge of the leaf. Hickory Vein Gall—*Phylloxera caryævenæ*—Carya Glabra.

Cone-shaped gall about 3 mm. in diameter, on the upper side of the leaf. Green in color; the opening on the lower surface is fringed with hairs. Hickory Cone Aphid-Gall—*Phylloxera caryæfallax*—Plate I., fig. 4. Carya ovata.

Hemispherical gall on the upper surface of the leaf, opening on the under surface by means of a narrow slit, ⅛ to ¼ of an inch in diameter. Hickory Hemispherical Gall Phylloxera caryæ-globuli—*Dactylosyhæra hemispæricum*—Carya alba.

Expansion of the young fruit or ovary to two or three times the size of the normal fruit. The centre of the gall is filled with Aphids. Fruit Gall—*Phylloxera* (undescribed)—Carya ovata.

Conical or sometimes almost spherical, red or purplish gall on the under surface of the leaf along the veins. Hickory Cone Gall—*Cecidomyia sanguinolenta* (O.S.)—Carya ovata.

Smooth and rounded, with a fine elongated tip, 5 to 6 mm. in height and 2 to 3 mm. in greatest diameter. Pale green, turning brown in autumn on the under surface of the leaves. Hickory Seed Gall—*Cecidomyia caryœcola* (O.S.)—Carya ovata.

Sub-globular, pubescent, onion-shaped gall on the under side of the leaves. The pubescence is pale when gall is young and rose-coloured when mature. Hickory Onion Gall—*Cecidomyia holotricha* (O.S.)—Plate R., fig. 6. Hicoria ovata.

Narrow, cylindrical, tube-like gall, on the under side of the leaves. Green when immature becoming brown or blackish when ripe. Hickory Tube Gall—*Cecidomyia tubicola*—Carya alba.

Rounded, brownish, downy gall on the under side of the leaves. Resembles somewhat a diminutive peach. About ⅛ to 1/5 of an inch in diameter. Hickory Peach Gall—*Cecidomyia persicoides*—Carya ovata.

Large, irregular knobs all over the husk of the nut containing thick-walled cells. Hickory Nut Gall—*Cecidomyia caryœnucicola*—Carva alba.

Thin-walled galls about 3 mm. in diameter, hard and brittle, attached to the under side of the leaves by a projection at the base which appears on the upper side as a black dot surrounded by a light yellow areola. Hickory Ball Gall—*Doplosis caryœ*—Plate F., fig.1. Carya ovata.

B.—*Galls on Stems.*

Large, globular or hickory-nut shaped galls on the stem, petiole or mid-rib of the leaf. Variable in size. Hickory Aphid Gall—*Phylloxera caryœcaulis* (Fitch)—Carya ovata.

Affecting Horse-Balm.

An inverted, pear-shaped gall much resembling the gall in the Wood Nettle. The large end is weakly attached to a vein on the underside of the leaf. Horse-balm Leaf Gall—*Cecidomyia collinsoniœ* (Beutm)—Plate O., fig. 4.

Affecting Huckleberry.

Rounded or elongated galls 1-2 cm. in diameter on the stem of the Huckleberry. Huckleberry Gall—*Solenogopheria vacinii* (Ashm)—Gaylussacia resinosa.

Affecting Genus Juglans.

The Walnut and Butternut.

A brown, velvety erineum surrounding the leaf stalks, or on the main veins, causing a swelling or bending of the stalk or vein. Walnut Cushion Gall—*Eriophyes* sp.—Plate D., fig. 2. Juglans nigra and probably J. cinerea.

A green pocket-gall on the upper side (usually) of the leaf. Walnut "Wart" Gall—*Eriophyes* sp.—Juglans nigra and probably J. cinerea.

Affecting Juneberry.

Small nearly globular, dark brown, pocket galls, averaging 2 mm. in diameter, singly or in clusters on the upper side of the leaf. Juneberry Ball Gall—*Eriophyes* sp.—Plate D., fig. 1. Amelanchier rotundifolia.

Affecting Locust.

Oval swellings on the branches and twigs, generally occurring at the junction of the leaf petiole with the branch. Locust Twig Borer—*Ecdytolopha insiticiana*—Gleditschia triacanthos.

Affecting Maple.

A whitish frost-like erineum with scattered spots of rosy pink, on the upper surface of the leaf, sometimes nearly covering it. *Eriophyes* sp.—Plate H., fig. 1. Acer rubrum.

A pale yellow or white erineum on the under side of the leaf. Trichomes capitate. *Eriophyes* sp.—Acer saccharinum.

A nearly spherical pocket gall on the upper surface of the leaf, varying from light green through red or purple to black. *Phlœcoptes quadripes*—Plate J., fig. 1. Acer saccharinum.

A white or whitish erineum in patches on the under side of the leaf, often limited by the veins. Trichomes capitate. When old the trichomes assume a brown color. *Eriophyes* sp.—Acer saccharum.

A green, reddish or purplish, slender, pouch-gall projecting from the upper surface of the leaf. *Phlœcoptes accris*—Plate M., fig. 6. Acer saccharum.

A white or whitish erineum in patches on the under side of the leaf. *Eriophyes* sp.—Acer nigrum.

Irregular wart-like swellings (Dimple) on the upper surface of the leaf. The swellings are green at first and turn gray when mature. The average diameter is about 3 mm. Manitoba Maple Wart Gall—*Eriophyes* sp.—Plate G., fig. 4. Acer negundo.

A white, whitish, or pale yellow erineum on the under side of the leaf, in patches often in the axils of the veins. Trichomes long, tangled and distorted.—*Eriophyes* sp.—Plate H., fig. 2, Acer spicatum.

Target-like, circular, flat galls on the leaves of Red Maple, Eye-spot Gall of Maple—*Cecidomyia ocellata*, O.S.—Plate F. fig. 6. Acer sp.

Swellings on the midrib of the leaflets much resembling the Ash Midrib Gall, Manitoba Maple Midrib Gall—*Cecidomyia negundinis* (Gillette.) Acer negundo.

Irregularly elliptical swellings along the veins of the leaves of Hard Maple, red, green or yellow in colour. Hard Maple Leaf-vein Gall—*Cecidomyid* sp.—Plate P. fig. 1. Acer saccharum.

Affecting Muhlenbergia.

Bud galls with very much enlarged glumes. Muhlenbergia Bud Gall—Lasioptera muhlenbergiæ (Naster) Muhlenbergia glomerata.

Affecting New Jersey Tea.

A terminal, spindle-shaped enlargement of the stem, 10-15 mm. long. New Jersey Tea Stem Gall—*Stagmatophora ceanothiella* (Cosens)—Ceanothus americanus.

Affecting Oak.

An irregular dimple upon the blade of the leaf. From beneath it appears as an irregular concavity, lined with a tangled mass of white vegetable hairs. Oak Dimple Gall—*Euriophyes querci*—Plate L. fig. 3. Quercus macrocarpa.

A dense mat of brown hairs growing in large patches upon the under sides of the leaves. Oak Hair Gall—*Eriophyes* sp.—(Undescribed)—Quercus sp.

A dense, white pubescence upon the under side of the leaves causing a distortion and folding of leaf blade. The pubescence is inside the fold, forming the lining of the gall. Oak Fold Gall—*Cecidomyia Niveipila*, O.S. Quercus rubra.

Green or brown, narrowly oval, inflated galls produced along the veins on the under side of the leaves. The surface of the gall is netted with veins. Oak Vein Gall—*Cecidomyia quercus majalis* O.S.—Plate E., fig. 5. Quercus rubra.

Pale red, saucer-shaped galls in clusters on the under surface of the leaf. Oak Spangles—*Cecidomyia poculum* O.S. Quercus alba.

Small, bright red galls, joined to the leaf by a small portion of the surface, so that they are easily detached without injuring the leaf. The surface of the gall is netted with innumerable fissures between which are small elevations with very short spines. When on the under side of the leaf, the gall is white in color. Oak—*Acraspis macrocarpa*—Quercus macrocarpa.

White, furry, hemispherical mass varying from 4-11 mm. in diameter. This is composed of innumerable fine, woody fibres to which are attached small, round kernels. The Larger Furry Ball Gall—*Andricus lana*—Plate E., fig. 1. Quercus macrocarpa.

Small, button-like enlargements upon the upper and lower surfaces of the leaves. Button Gall—*Neuroterus umbilicatus* (Bass)—Plate B., fig. 6. Quercus macrocarpa.

Small, dithalamous, pea-shaped gall on the upper side of the leaf. The surface is fissured or netted with depressions between which are elevations. Oak Pea Gall—*Cynips Pisum*—Quercus alba and macrocarpa.

Hard, woody gall occurring on midrib or petiole. Green or red in color and more or less roughened on the surface. Oak Petiole Gall—*Andricus petiolicola.*

Large globular gall about 4 cm. in diameter. Exterior surface smooth and somewhat irregular. Interior filled with a spongy mass of fibres, very loosely attached to the wall of the chamber. The Larger Oak Apple Gall—*Amphibolips confluentis*, (Harr.)—Plate E., fig. 2.

Small. pale-green, wart-like gall situated in the parenchyma of the leaf and protruding beyond both surfaces but chiefly beyond the lower. Inside are two or three seed-like, oblong kernels, kept in position by white filaments. Oak Wart Gall—*Andricus futilis*, O.S.—Plate B. fig. 4. Quercus macrocarpa.

Round or oval galls growing on the midrib of the leaf. The gall is white or yellowish and covered with fine bright pink or red spines about 1-2 mm. in length. Oak Hedgehog Gall—*Acraspis crinacei*—Plate R. fig. 1. Quercus alba.

Small spherical gall about 3 mm. in diameter upon the veins of the leaves upon the under side of the leaf. It is thickly covered with fine short hair which forms a cushion all around it. Oak Furry Ball Gall—*Neuroterus floccosus*—Plate R. fig. 2. Quercus alba.

Large, smooth, spherical galls from 2-3 cm. in diameter occurring on the under side of the leaves. The small, spherical, larval cell within the cavity is held in position by a comparatively small number of filaments which radiate from it to the surrounding walls. Empty Oak Apple Gall—*Amphibolips inanis* (O.S.). Quercus rubra.

Somewhat circular, about 4 mm. in diameter, projecting on both sides of the leaf. Above dark red, below yellowish, about three times the thickness of the leaf. Oak—*Andicus papillatus* O.S.—Plate C. fig. 5. Quercus rubra.

Irregular woody swellings of the midrib about 7-8 inch in length, surface is glabrous or slightly pubescent and projects on both sides of the leaf. Oak Midrib Gall—*Andricus pigæ*—Plate E. fig. 3.

Globular, hollow gall, nearly always at the outer edge of the leaf blade. From .9-1 cm. in diameter and comparatively thin walled. Oak Apple Gall —*Andricus singularis* (Bass.) Quercus rubra.

Cluster of dense, narrow leaflets, springing from a bud. Oak Leafy-wreath Gall—*Andricus topiarius* (Ashm).—Plate C. fig. 6. Quercus macrocarpa.

B.—*Galls on stem.*

Spherical gall, hard and woody with a small cavity in the centre. A short joint at the apex distinguishes this species from Globulus. Pointed Bullet Gall—*Holcaspis duricaria* (Bass.) Quercus macrocarpa.

Hard, conical galls occurring in numbers on the stems. Oak Cone Gall—*Andricus ventricosus* (Bass.)—Plate R. fig. 3. Quercus sp.

Small, soft, bladder-like, one-celled structures, each about 1-3 of an inch in diameter. Arranged in a cylindrical cluster along the stem of the branches. Oak Fig Gall—*Biorhiza forticornis* (Walsh)—Plate C. fig. 2. Quercus alba.

Rosette or head of hard, brown, nut-like, wedge-shaped structures fitting closely to one another and attached at the base to a small, spherical receptacle about ¼-1-3 of an inch in diameter. Pine-cone Oak Gall—*Cynips strobilana* (O.S.)—Plate C. fig. 4. Quercus macrocarpa.

Irregularly oval, woody gall encircling the stem. Polythalamous, containing many cream-colored cases attached to the twig, each case looking very much like an oat seed. Oak Seed Gall—*Andricus seminator* (Harr.)—Quercus alba.

Rough, hard, woody, somewhat globular, knot-like gall, encircling the stem and varying greatly in size, but commonly 1-2 inches in diameter. Oak Knot Gall—*Andricus Punctatus* (Bass.)—Plate C. fig. 1. Quercus coccinea.

Bullet-like, corky gall with a small cavity in the centre. On stem of Burr Oak and White Oak. Oak Bullet Gall—*Holcaspis globulus* (Fitch). Quercus macrocarpa and Q. alba.

Club-shaped, hard and woody with often a few leaves growing from it. ½ to 1 inch in length. Club Gall—*Andricus clavula* (Bass.)—Plate C. fig. 3.

Affecting Poplar.

A. Galls on the leaves.

Small, circular, pimple-like elevations on the upper surface of the leaf, with a corresponding depression on the lower surface. Pimple Gall. (Plate P. fig. 3.)—Populus balsamifera.

Leaf folded at its edge to form a red or green pouch over the gall which is narrow and tent-shaped, and is formed from the leaf surface. Aspen Tent Gall—Plate P. fig. 2. Populus tremuloides.

Oblong enlargements of the petiole close to the base of the leaf. *Nepticula* sp.—Populus tremuloides.

Pear-shaped, monothalamous galls growing on the upper side of the leaf and joined to the leaf by a slight constriction. Aspen Ball Gall—Plate P. fig. 5.—Populus tremuloides.

Large, irregular galls on the tips of the twigs, consisting of a double row of lamina; between these two layers are large numbers of aphids. Vagabond Gall—*Pemphigus vagabundus*—Populus deltoides.

Irregular, spherical gall developed at the junction of the petiole and blade of leaf. Poplar Petiole Gall—*Pemphigus populicaulis*—Plate I. fig. 3. Populus deltoides.

Circular, flat or slightly convex, frost-like patches varying from 2-3 mm. in diameter; on the upper side of the leaf. Large-toothed Aspen Frost Gall—*Eriophyes* sp.—Populus grandidentata.

Circular depressions dimple always on the lower side of the leaf. On the upper side it appears as a green red circular elevation. Large-toothed Aspen Convex Gall—*Eriophyes* sp.—Plate M. fig. 1 & 2. Populus grandidentata.

Dimple-like galls on the upper side of the leaf of the Aspen. Aspen Dimple Gall—*Eriophyses* sp.—Plate M. fig. 3. Populus tremuloides.

Irregular, warty protuberances on the midrib or other veins of the leaf and extending beyond both surfaces but chiefly the upper one. Large-toothed Aspen Vein Gall. Populus grandidentata.

Irregular tubercular masses of closely-packed small reddish-green protuberances on the stem. Unsightly Poplar Gall—*Eriophyes* sp. Populus tremuloides.

A depression on the lower surface of the leaf, 4-12 mm. in diameter and 2-5 mm. in depth. Under surface of gall is orange yellow—*Eriophyes* sp. —Plate D., fig. 3. Populus italica. ...

Margin of leaf distorted and curled. *Eriophyes* sp.—Plate T., fig. 1. Populus tremuloides.

B.—*Galls on the stem.*

Irregular swellings caused by a species of Woolly Aphis, on the smaller branches and twigs of the Cottonwood. Woolly Aphid Stem Gall—*Schizoneura* sp. Populus deltoides.

Irregularly oval, about 1-3 to ½ inch long, smooth and about the same color as the bark. Usually on one side of a branch but sometimes nearly encircling it. Aspen Egg Gall—*Agronyzaaoneiventris* (Fallen).—Plate A., fig. 8. Populus tremuloides.

Affecting Genus Prunus.

Reddish, slender pouch-galls, somewhat irregular and pubescent, 3-4 mm. long and .5-1 mm. in diameter. Pin Cherry Pouch Gall—*Eriophyes* sp. Prunus pennsylvanica.

Green or rosy-red pouch gal on the upper side of the leaf, .5-6 cm. in length. The gall is constricted about half way to the leaf. Black Cherry Pouch Gall—*Eriophyes* sp. Prunus serrotina.

Green or reddish pouch gall on the upper side of the leaf, differing from the Black Cherry Pouch Gall in that the aperture is not funnel-shaped. Choke Cherry Pouch Gall—*Eriophyes* sp.—Plate G., fig. 2. Prunus virginiana.

A very long, slender pouch-gall, green or whitish on either side of the leaf. Wild Plum Pouch Gall—*Eriophyes* sp.—Plate K., fig. 2. Prunus americana.

A tubercular growth, encircling base of buds and shoots. Plum Bud Gall—*Eriophyes phloeocoptes*. Prunus domestica.

A club-shaped, monothalamous gall with one or two leaves growing from its side. The gall is an enlargement of the terminal buds of young

shoots. Black Cherry Bud Gall—*Cecidomyia serotinae*. Prunus Serotina.

A malformation of the fruit. The pit or stone is absent and the fruit is enlarged, forming a thick walled pouch about 1 cm. in length by 5 mm. in width. Chokecherry Pocket Gall—*Cecidomyia virginiana*. Prunus virginiana.

Affecting Genus Pyrus.

Apple, Crab Apple, Pear and Chokeberry.

Dimple galls, with the concavity on the upper surface of the leaf. Internal surface corrugated. Apple Dimple Gall—*Eriophyes* sp. Pyrus malus.

Capsule Galls on the upper side of the leaf. Apple and Pear "Leaf-blister" Gall—*Eriophyes pyri*—Plate K., fig. 6. Pyrus malus, P. coronaria and P. communis.

Knot-like swellings on the stems. Woolly Aphis Gall—*Schizoneura langigeria*. Pyrus malus.

Capsule Galls, very small. When mature, brown in color. Chokeberry Speck Gall—*Eriophyes* sp. Pyrus arbutefolia.

Affecting Rose.

A.—*Galls on the leaves.* ...

Small, thin walled, spherical galls, red or green in colour, and covered with short spines. About .75 cm. in diameter and monothalamous. Spiny Ball Gall—*Rhodites nebulosus*.—Plate F., fig. 2. Rosa Carolina.

Small, circular galls about 3 mm. in diameter on the upper surface of the leaf. Pale green in colour and characterized by the presence of a little nipple in the centre of the gall. Nipple Gall—*Rhodites lenticularis* (Bass.) Rosa Carolina.

Round, woody, globular or irregularly shaped galls, covered with a white mealy substance. Mealy Rose Gall—*Rhodites ignotus* (O.S.)—Rosa sp.

B.—*Galls on the stem.*

Smooth, corky enlargement rising at each end abruptly from the branch; 2-2.5 cm. in length and 1-1.5 cm. in width. Globular Rose Gall—*Rhodites globulus*.—Plate F., fig. 4. Rosa Carolina.

Hard, small cells, clustered around a branch or twig. The cells are covered with a dense, thick mass of green filaments which grow from them; monothalamous and from 1.5-2 cm. in diameter. Mossy Rose Gall—*Rhodites rosae*—Plate E., fig. 4. Rose Carolina.

Large, round or oblong galls from 1 to 2 inches in length; reddish brown and covered with stout spines or prickles. Spiny Rose Gall—*Rhodites multispinosus* (Gill.)—Plate B., fig. 3. Rosa sp.

Spherical, covered with many prickly spines which vary in length, and are sometimes larger than the diameter of the gall. Internally it is hollow with the wall about 1 to 2mm. thick. Yellowish green, sometimes tinged with red. Soft and fleshy in summer, woody and brown in winter. It is found singly or in clusters of from two to ten or more, upon twigs of different kinds of wild roses. (Beutm.)—*Rhodites bicolor* (Harr.). Rosa sp.

Elongated swelling of the branch, gradually tapering at both ends. Smooth or densely covered with short spines. About 2 inches long and polythalamous. Long Rose Gall—*Rhodites dichlocerous* (Harr.). Rosa sp.

C.—*Galls on the roots.*

Large, irregularly rounded, reddish-brown galls from 1 to 2 inches in length; polythalamous. Rose Root Gall—*Rhodites radicum* (O.S.). Rosa sp.

Affecting Spiræa.

A pod-like gall formed by the folding of the leaf along the midvein. Spiræa Pod Gall—*Cecidomyia salicifolia*—Spiræa tomentosa, S. salicifolia and S. betulæfolia.

A bud-like, sessile gall in the axil of the leaf. Meadow Sweet Bud Gall—(Undescribed)—Spiræa salicifolia.

Small, cone-shaped galls on either the upper or lower surface of the leaf. Spiræa Cone Gall (Undescribed)—Spiræa salicifolia.

Affecting Sumac.

The leaf margin rolled tightly upward and inward on both sides. Sumac Leaf-margin Gall—*Eriophyes* sp.—Plate K., fig. 3. Rhus typhina.

Irregular, rounded, dimple gall, convex on the upper or under side of the leaf. Green to red or purple in color; inside clothed with white trichomes. Poison Ivy Dimple Gall—*Eriophyes* sp.—Plate G., fig. 5. Rhus radicans.

Large, smooth, rounded galls, somewhat resembling a tomato in shape, on the under sides of the leaves. Sumac Potato Gall—*Pemphigus rhois.* Rhus typhina.

Affecting Strawberry.

A much elongated, cylindrical enlargement of the petiole of the leaf, 1 to 4 in. long and 1-10 to 1-6 in. in diameter. Its surface, owing to slight annular constrictions has a more or less segmented appearance. The constrictions are seldom more than about .5 mm. deep and as a rule do not occur at regular intervals. Sometimes they are found every 1-16 of an inch, but in other cases they are as much as an inch apart. The surface of the gall is nearly red, or greenish, and is pubescent like the rest of the petiole. The texture is pulpy. The gall is polythalamous, as few as 10 and as many as 35 small chambers having been counted in specimens examined. These are all centrally situated and each contains a single, white larva, August 7, 1907. Occasionally two separate galls or gall clusters are found on a single petiole. Strawberry Petiole Gall. Plate R., fig. 7. Fragaria Virginiana.

Affecting Touch-me-Not.

Globular, succulent, semi-transparent, at base of flowers. Touch-me-not Flower Gall—*Cecidomyia impatiens* (O.S.). Impatiens fulva.

Green, succulent, globular or irregularly rounded swelling on the stem, petiole or leaf. Touch-me-not Stem and Leaf Gall—*Cecidomyia.* —Plate O., fig. 2. *fulva* (Bent)—Impatiens fulva.

Affecting Tulip Tree.

Hollow swellings, varying from 5 to 2.5 cm. in length on the midrib and lateral veins of the leaves. Tulip Tree Midrib Gall—*Cecidomyia tulipifera*—Liriodendron tulipifera.

Affecting Vervain.

An oval, hard and woody gall, an enlargement of the stem. Blue Vervain Stem Gall (Undescribed)— Verbena hastata.

Affecting Viburnum.

A small, blister-like gall, circular in outline, 3-4 mm. in diameter. Viburnum Leaf Blister Gall. Viburnum acerifolium.

Affecting Virginia Creeper.

Green and succulent fold gall on the midrib of the leaf. Midrib Gall on Virginia Creeper—*Cecidomyia* sp.—Plate E., fig. 7. Ampelopsis quinquefolia.

Affecting White Lettuce.

Large, rough, irregular swellings on stem. White Lettuce Stem Gall—*Aulax nabali* (Brodie)—Plate R., fig. 5. Prenanthes alba.

Affecting Willows.

A.—*Galls on leaves.*

Smooth, fleshy, sessile, globular or slightly oval, monothalamous gall like a miniature apple. About 1 cm. in diameter growing on one side of the midrib of the leaf. Willow Apple Gall—*Pontania pomum*—Salix sp.

Smooth, flattish, glossy enlargements of the petiole or often of the midrib of the leaf near the base. Willow Petiole Gall—*Pontania desmodeoides*. Salix lucida.

Irregularly elongate-oval fleshy galls projecting equally on both surfaces of the leaf. Usually many on a leaf. Willow Flat Gall—*Pontania hyalina*—Salix sp.

Cluster of massed leaves surrounding a small cell containing a yellowish larva. Similar in appearance to the Goldenrod Bunch Gall. Willow Bunch Gall—*Rhabdophaga brassicoides*—Salix sp.

A pale green or purple capsule gall, projecting either above or below the leaf, or both; 1½ to 2 mm. in diameter. *Eriophyes* sp. Salix cordata.

Small, irregular, serrate and roughened pocket-galls or semi-capsules, green or red, strongly pilose above and thickly pubescent beneath. Usually on the upper side of the leaf. *Eriophyes* sp.—Plate K., fig. 4. Salix discolor.

Small, crimson pocket-galls or semicapsules on the upper side of the leaf. 1½ to 2½ mm. in diameter. *Eriophyes* sp. Salix amygdaloides.

A small capsule gall, irregularly hemispherical, greenish yellow, with a projecting aperture usually on the lower surface of the leaf, 1 to 2½ mm. in diameter. *Eriophyes* sp. Salix nigra.

Small irregular, serrate capsule-gall, green or red, usually on the upper side of the leaf; beneath sometimes impressed, more often projecting. 1 to 2 mm. in diameter. *Eriophyes* sp. Salix bebbiana.

Small irregular, serrate capsule-gall, projecting on both sides of the leaf, 1 to 2 mm. in diameter. *Eriophyes* sp. Salix petiolaris.

A bud deformation of the flower catkins and leaf buds or parts of leaves, producing a large, irregular, crumpled mass. *Eriophyes* sp.—Plate D., fig. 5. Salix nigra.

Rosette-like structures on the leaves and stems. Unsightly Willow Gall—*Eriophyes* sp. Salix sp.

This gall has two different forms in the course of its development. There is first the "bead" stage, when each gall looks like a small yellowish-white bead about 1.5 mm. in diameter, two-thirds of the bead appearing on the under and nearly one-third on the upper surface of the leaf. The tip of the bead, on the lower side of the leaf, is perforated. The texture is hard and close and the surface even and somewhat pubescent. The sec-

ond stage seems to occur in July. In this month the galls elongate on the lower surface into nipples 3-4 mm. long and 1-1.5 mm. in diameter. The color is rather lighter than before, except that the end of the nipple itself is often nearly black. The pubescence is much more visible than before. The galls occur either singly or in closely united groups of 2-15, chiefly along or near the midrib. They are monothalamous but no larvae were discovered in the specimens examined. Willow-leaf Bead and Nipple Gall—(Undescribed)—Salix rostrata.

B.—*Galls on stems.*

Large, rough galls on the stems of the Willow. The galls are smooth at first but become rough later in the season. Willow Branch Gall—*Saperda concolor*—Salix sp.

Cone-shaped mass of closely-imbricated leaves at the end of a twig, caused by the arrest of growth at the end of the stem. Pine Cone Willow Gall—*Cecidomyia strobiloides*.—Plate O., fig. 7. Salix sp.

Club-shaped gall formed on the lateral shoots of the Willow, an enlargement of the whole stem. About ¾ of an inch in length. Willow Club Gall—*Cecidomyia rigida*—Salix sp.

Oval galls on the sides of the twigs, hard and woody and usually the same colour as the stem.

Willow Egg Gall, *Euura ovum*—Salix sp.

Oblong-ovate, polythalamous galls, about the same color as the bark while young but gray when mature. Willow Potato Gall—*Rhabdophaga batatas* O.S.—Plate A., fig. 7. Salix sp.

Irregularly woody, oval enlargement of the stem at the joints or nodes. 1-3 to ½ an inch in length. Willow Joint Gall—*Rhabdophaga nodulus* (Walsh). Salix sp.

C.—*Galls of the Buds.*

Altered or transformed buds. The bud scales become elongated and the interior becomes a cavity in which the larva lives. Willow Bud Gall—*Rhabdophaga trilicoides* (Walsh). Salix sp.

Affecting Wild Lettuce.

An irregular, oval, polythalamous, knotty enlargement of the stem varying greatly in size. The interior is soft and pithy. Lettuce Tumor Gall—*Aulax tumidus*—Lactuca Canadensis.

Affecting Witch Hazel.

A conical swelling on upper side of leaf. Witch Hazel Cone Gall—*Hormaphis hamameliais* (Fitch).—Plate I., fig. 2. Hamamelis virginiana.

Round gall covered with long spines. A deformation of the fruit bud. Spiny Witch-Hazel Gall—*Hormaphis spinosus*—Plate I., fig. 1. Hamamelis virginiana.

Affecting Wood Nettle.

Ball-like galls occurring either on the upper or lower surface of the leaf. Wood Nettle Ball Gall—*Cecidomyia urnicola*—Plate F., fig. 3. Laportea Canadensis.

A gall consisting of a malformation of the fruit, much like the ball gall on the leaves. Wood Nettle Fruit Gall—*Cecidomyia* sp.—Laportea Canadensis.

Soft, smooth, spongy, oval or rounded gall of a pale brown colour, on the stem. About 1 cm. in diameter. Wood Nettle Pod Gall—(Undescribed). Laportea Canadensis.

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PLATE I.

1. Spiny Witch-Hazel Gall. (*Hormaphis spinosus.*)
2. Witch-Hazel Cone Gall. (*Hormaphis hamamelidis.*)
3. Cottonwood Petiole Gall. (*Pemphigus populicaulis.*)
4. Hickory Cone Gall. (*Phylloxera caryae-fallax.*)
5. Cockscomb Gall on Elm. (*Colopha ulmicola.*)
6. Basswood Mite Gall. (*Eriophyes abnormis.*)

PLATE J.

1. Soft Maple Mite Gall. (*Phloecoptes quadripes*).
2. Two specimens on left. (*Eucosma scudderiana.*)
3. Two specimens on right. (*Trypeta solidaginis.*)

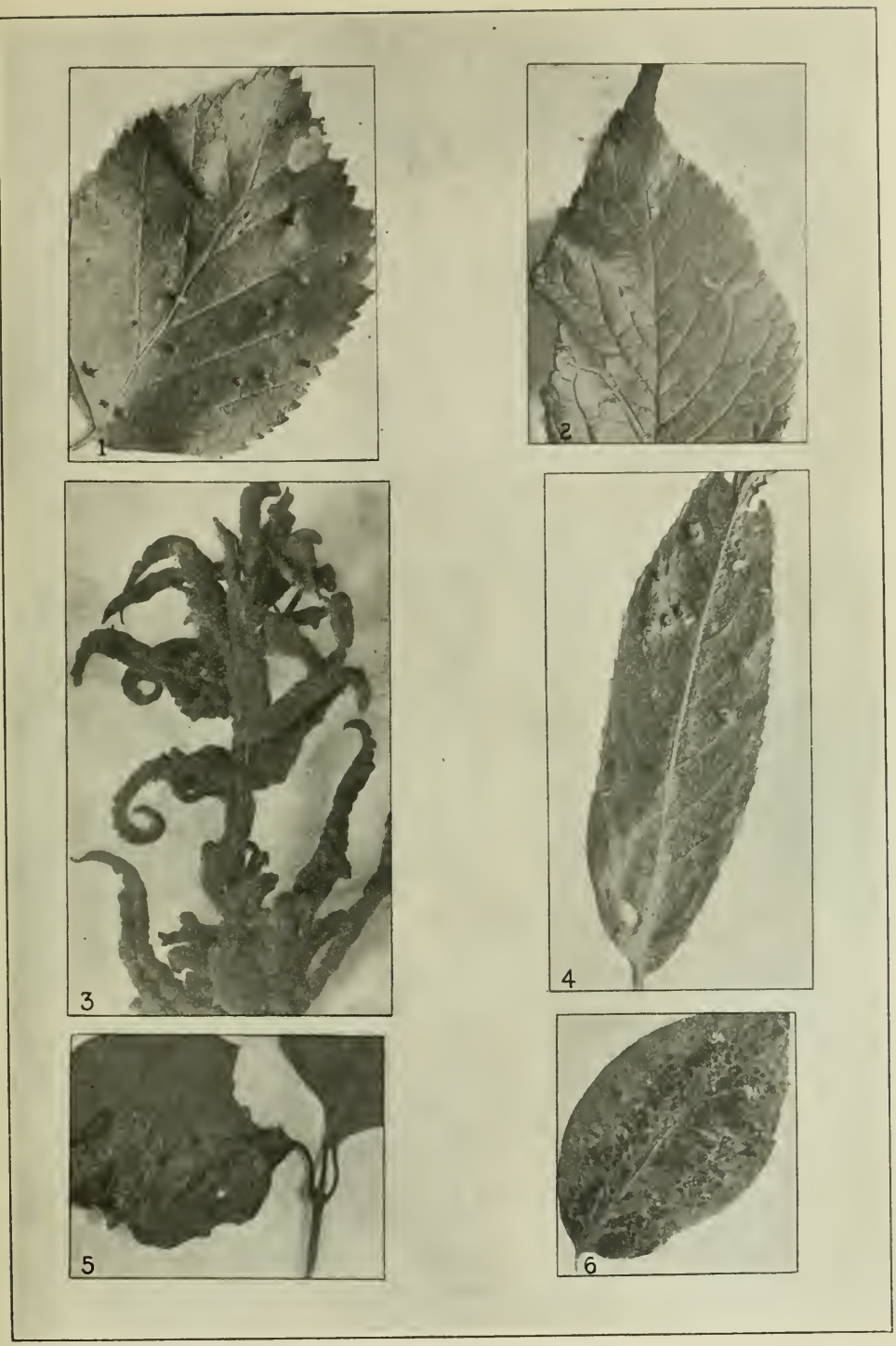

PLATE K.

1. Eriophyes sp., Betula papyrifera.
2. Eriophyes sp., Prunus Americana.
3. Eriophyes sp., Rhus Cotinus.
4. Eriophyes sp., Salix discolor.
5. Eriophyes cephalanthae, Cephalanthus occidentalis.
6. Eriophyes pyri sp., Pyruis communis.

PLATE L

1. Eriophyes sp., Populus tremuloides.
2. Eriophyes sp., Fraxinus Americana.
3. Eriophyes sp., Quercus macrocarpa.
4. Eriophyes sp., Vitis sp.
5. Eriophyes sp., Ulmus Americana.
6. Eriophyes sp., Ulmus pubescens.

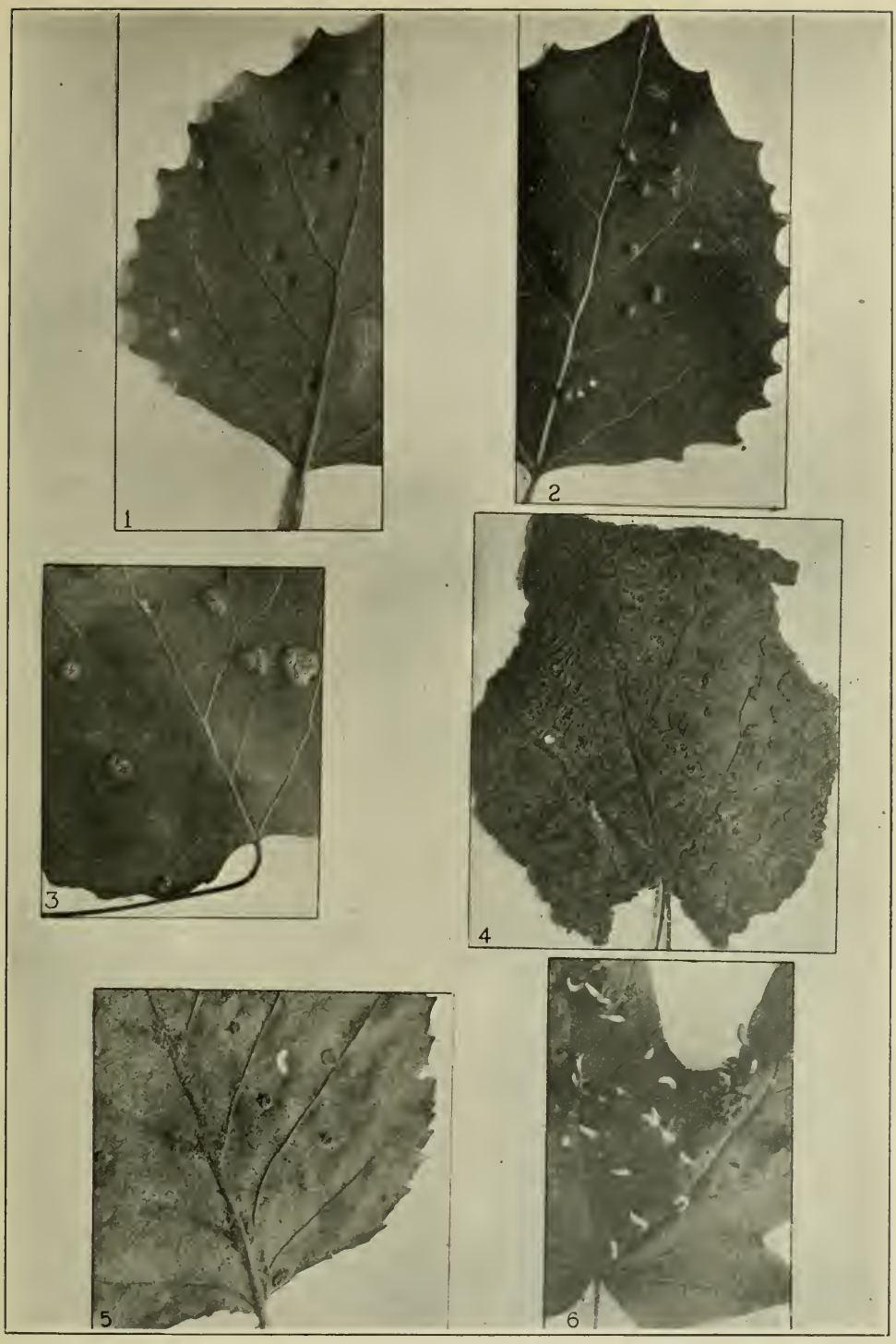

PLATE M.

1. Eriophyes sp., (under surface) Populus grandidentata.
2. Eriophyes sp., (upper surface) Populus grandidentera.
3. Eriophyes sp., Populus tremuloides.
4. Eriophyes sp., Tilia Europea.
5. Eriophyes sp., Betula papyrifera.
6. Phlœcoptes aceris, Acer saccharum.

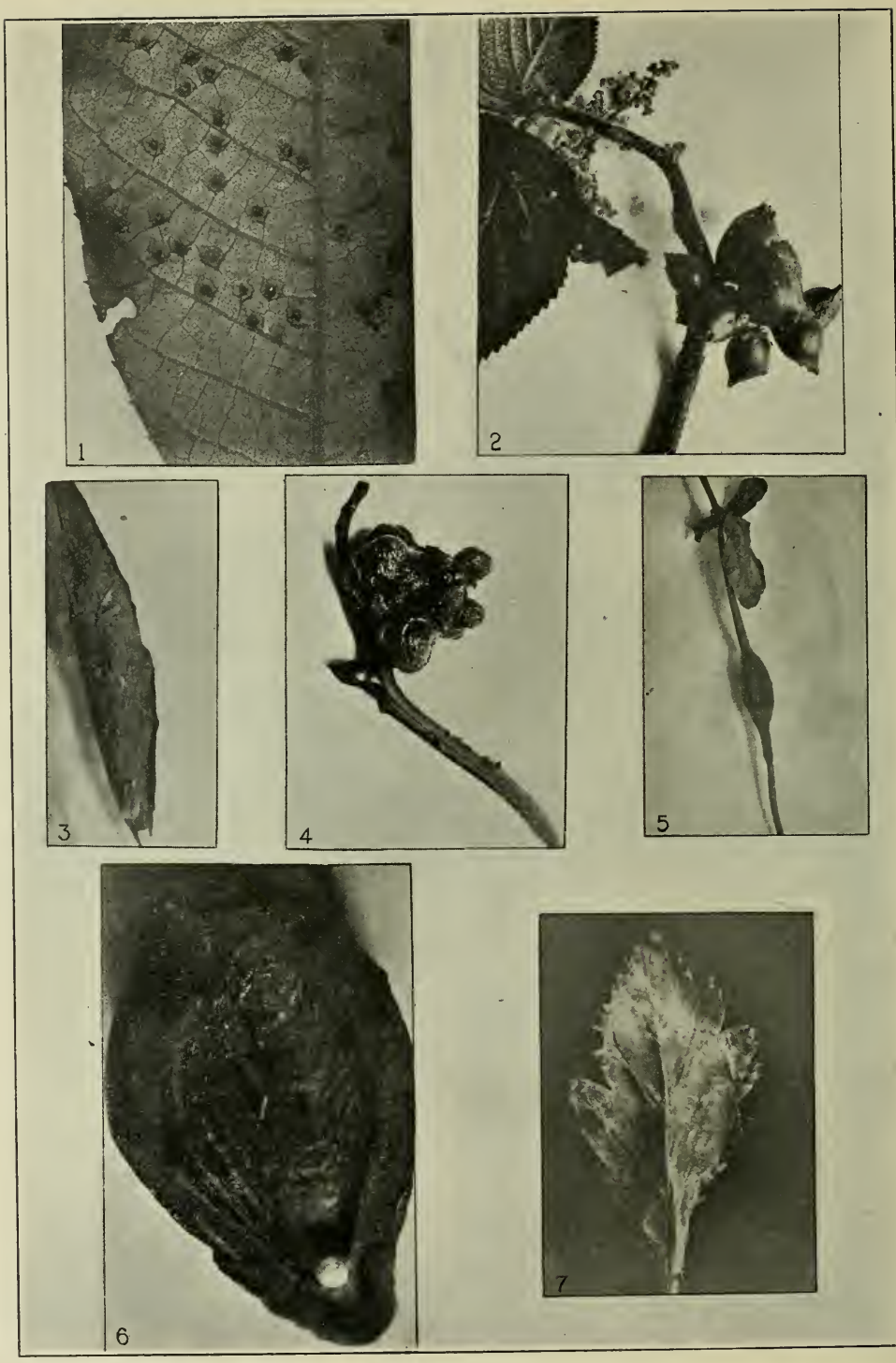

PLATE N.

1. Hickory Gall.
2. Pod or fruit gall, Laportea Canadensis.
3. Golden Rod seed gall, Solidago Canadensis.
4. Cecidomyia caryae-nucicola, Carya alba.
5. Lasioptera lycopi, Lycopus virginicus.
6. Cecidomyia virginiana, interior of gall, Prunus virginiana.
7. Hawthorn Leaf-border gall, Crataegus sp.

PLATE O.

1. Cecidomyia viticola, vitis sp.
2. Cecidomyia sp., Impatiens fulva.
3. Cecidomyia bedeguar, Ceataegus.
4. Cecidomyia? collinsoniae, Collinsonia Canadensis.
5. Hawthorn Bladder gall, Crataegus, sp.
6. Gooseberry Bud gall, Ribes grossulare.
7. Cecidomyia Strobiloides, Salix discolor.

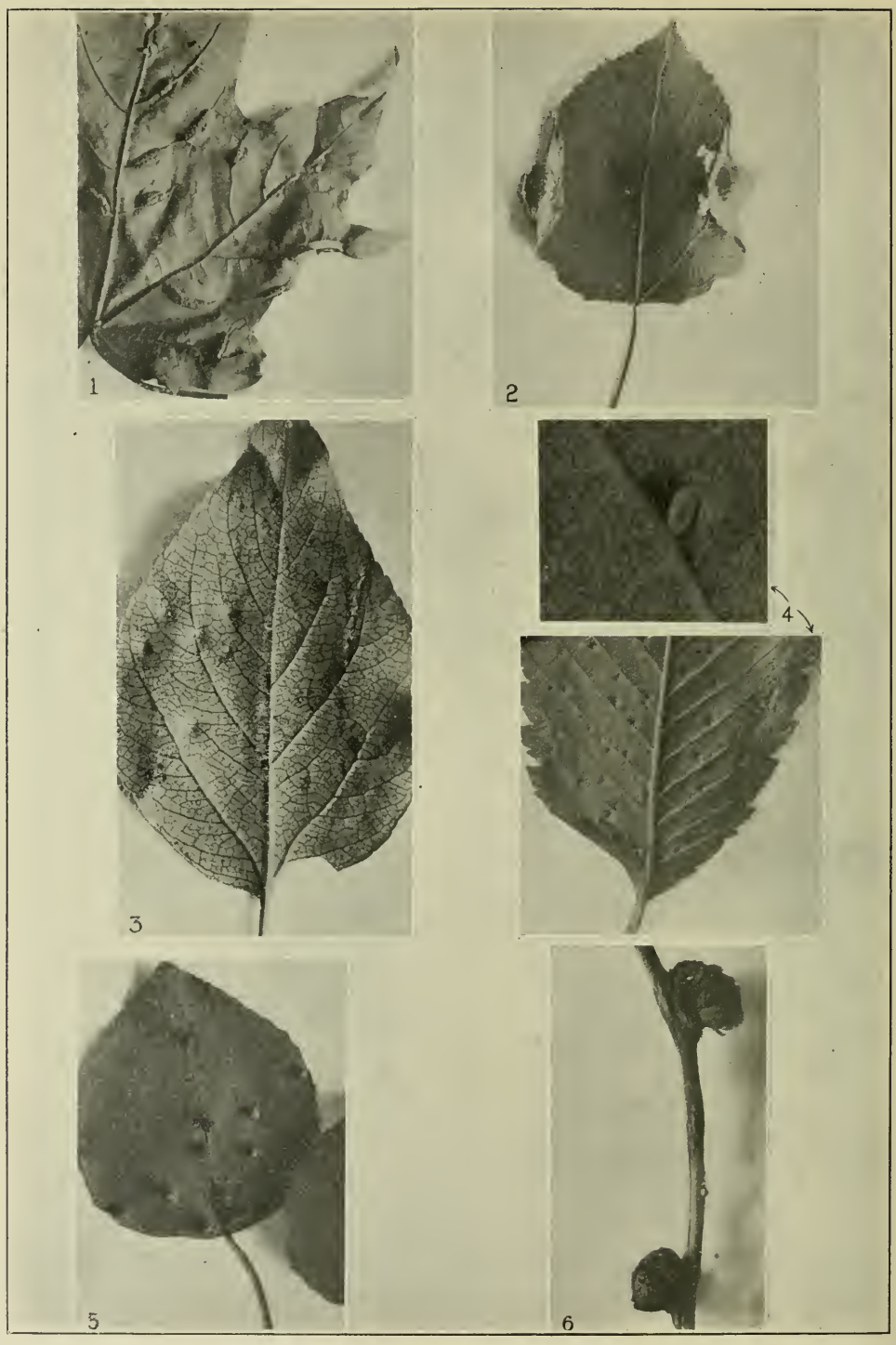

PLATE P.

1. Maple Vein gall, Acer Saccharum.
2. Aspen Tent gall, Populus tremuloides.
3. Balm of Gilead pimple gall, Populus balsamifera.
4. Elm-Pimple gall, Ulmus Americana.
5. Aspen Ball gall, Populus tremuloides.
6. Red Elm Bud gall, Ulmus fulva.

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ENTOMOLOGICAL RECORD 1908.

By James Fletcher and Arthur Gibson.

The season of 1908 in most parts of Canada was an exceptionally dry one. The continued drought which began in early June, lasted well on into September in many parts of the Dominion. The weather, too, was extremely hot, and vegetation, consequently, was much injured and reduced in vigour. Insects have been particularly numerous in certain localities, and some kinds of injurious species were very destructive. From the collector's standpoint, the season, on the whole, throughout the country, was probably better than that of each of the three or four preceding years. Some correspondents report that the season in their immediate vicinity has been a particularly poor one, others that it has been an improvement on the recent years. More are of the latter opinion.

As in the past a great many records have been sent in by correspondents. From these have been taken those which, for one reason or another, have been thought to be of most interest. As has been pointed out before, an insect may seem rare to the collector who sends in the record, when in reality, its occurrence may be widerspread, and for this reason not worth recording in the Record.

As in previous years, some of the federal Government officers brought back with them, from their distant fields of labour, small collections of insects of special interest. Mr. Joseph Keele, during the past summer, made some valuable collections at the mouth of the Gravel River and along the McKenzie River adjacent, on the eastern slope of the Rockies. Mr. C. H. Young, of the same Department, spent the months of August and September at the Biological Station, Departure Bay, B.C., with the well-known lepidopterist, Rev. G. W. Taylor, who is now there as Curator of the Station. Mr. Young collected insects of several orders, among which are many of much interest. Mr. Douglas H. Nelles, of the Alaska Boundary Survey, spent the summer in the Yukon District, between White Horse and the 141st Meridian, and made a collection of butterflies. Mr. Andrew Halkett of the Fisheries Museum, returned to Ottawa in November, bringing with him a small collection of various insects taken in Alberta. Dr. Fletcher made a hurried trip to British Columbia in September and October, and while stopping over for a day or two, each at Nepigon, Ont.; Regina, Sask.; Banff and Laggan, Alta.; and Departure Bay, B.C., collected many insects of value. Mr. Gibson spent most of July at Youghall, N.B., and while there made collections in all orders.

Acknowledgments are again due to the leading specialists in the United States who have rendered much help to Canadian students during the year: Dr. L. O. Howard, with his assistants at Washington; Dr. J. B. Smith, of New Brunswick, N.J.; Professor H. F. Wickham, of Iowa City, Iowa; Mr. W. D. Kearfott, of Montclair, N.J.; Mr. E. P. Van Duzee, of Buffalo, N.Y.; Mr. Wm. Beutenmuller and Professor R. C. Osburn, of New York, N.Y., and Prof. J. S. Hine, of Columbus, Ohio. Sir George Hampson, of the British Museum, has also been of much help in identifying specimens of lepidoptera.

N.B.—Owing to the death of my good friend, chief, and ever kind teacher, Dr. James Fletcher, the manuscript of the Entomological Record for 1908 has had to be prepared by me. Dr. Fletcher had, I know, certain records and other notes which he intended to include. I trust, however, that any omissions which may be noticed will be made known, so that they can be included in the Entomological Record for 1909.—*Arthur Gibson.*

Literature.

Among the many valuable publications which have been received during the past year, and which are of interest to Canadian students, mention may be made of the following:—

Banks, Nathan. Catalogue of the Neuropteroid Insects (except Odonata) of the United States. Philadelphia: Transactions, American Entomological Society, 1907. This valuable catalogue of neuropteroid insects was not received in time to be mentioned in last year's Record. The name of the author is sufficient to guarantee the usefulness of this list. Altogether there are nearly 900 species included in the catalogue, arranged under 210 genera.

Bethune, C. J. S. Bibliography of Canadian Entomology for the year 1907. Ottawa: Transactions of the Royal Society of Canada, Third Series—1908-1909, Volume II., Section IV.; separate received December 15, 1908. This paper, which is annually presented to the Royal Society of Canada by the Rev. Prof. Bethune, is a most useful publication. In the above bibliography, 125 references are made to contributions which have appeared during 1907, all of which are of value to Canadian students. With each reference a short explanatory statement is made. We are very grateful to the author for this annual publication. To many, it is the only source of reference to articles which have appeared during the year on Canadian Entomology.

Busck, August. A Generic Revision of American Moths of the Family Œcophoridæ, with Descriptions of New Species. Proc. U.S. Nat. Museum, Vol. XXXV., pp. 187-207; published Oct. 31, 1908. The results of Mr. Busck's work on Microlepidoptera are always of much value. In this paper the genera of the above family are treated of. As very little study had previously been given to the North American species, this contribution will be of great service to students of Tineid moths. Mr. Busck states that there are now 121 described species of this family represented in North America.

Bradley, J. Chester. The Evaniidæ, Ensign-flies, an Archiac Family of Hymenoptera. Trans. Amer. Ent. Soc., Vol. XXXIV., No. 2, April-May-June, 1908; pp. 101-194, 11 plates. This contribution deals with the North American species of Evaniidæ, insects which are usually not well represented in collections. References to species occurring in Canada are given and many new forms described. This paper will prove of much use to hymenopterists. The Ensign-flies, which are so named because they carry the abdomen aloft like a flag, are parasitic.

Caudell, Andrew Nelson. Notes on some Western Orthoptera, with the Description of one New Species. Proc. U.S. Nat. Museum, Vol. XXXIV, pages 71-81; published April 17, 1908. As this paper includes notes on species collected in western Canada in 1906, it will prove of value to those of our entomologists who study orthoptera. 27 different species are recorded, from British Columbia, Alberta and Saskatchewan.

Fernald, C. H. The Genera of the Tortricidæ and their Types. Amherst, Mass.; published by the author, June, 1908. Professor Fernald is to be congratulated on this most valuable piece of work. Over 300 generic names are reviewed. In the *Canadian Entomologist*, Sept. 1908, Mr. Kearfott says: "This work is the first of its kind that has ever been published in the Microlepidoptera. As its title implies, it takes up one by one every Tortricid genus known to the author, from the tenth edition of Linnæus down to the present day, and fixes and names the type species in each genus."

Harrington, W. Hague. Fauna Ottawensis: Hymenoptera—Superfamily III.—Vespoidea; The Ottawa Naturalist, July, 1908. This contribu-

tion to the insects of the Ottawa District is a most welcome one. Mr. Harrington has always paid special attention to the fauna of this locality, and, as our highest Canadian authority on the hymenoptera, the above paper, which mentions 87 different species, is of much value. In the introductory remarks information is given on the Families Ceropalidæ, Vespidæ, Eumenidæ, Chrysididæ, Bethylidæ, Tiphiidæ, Thynnidæ, Myromosidæ and Mutillidæ.

Kearfott, W. D. Descriptions of New Species of North American Crambid Moths. Proc. U.S. Nat. Museum, Vol. XXXV., pp. 367-393; separates published Oct. 31, 1908. In this valuable contribution to the Pyralidæ, 20 new North American species of crambid moths are described, 5 of which are from Canada.

Knab, Frederick. Observations on the Mosquitoes of Saskatchewan. Reprinted from Smithsonian Miscellaneous Collections (Quarterly Issue), Vol. 50; published Feb. 20, 1908. These observations were the result of an expedition to western Canada during the spring of 1907. Nine different species were collected, eight of the genus *Aedes* and one of the genus *Culiseta*. The habits of some of the species are discussed, and notes given on their life-histories.

Mitchell, Evelyn Groesbeeck. Mosquito Life. J. P. Putnam's Sons, New York and London. The Knickerbocker Press, (1907). This most interesting and extremely valuable book came to hand early in 1908. It reviews previous work on these important insects, and includes much original matter not previously published. The titles of the different chapters will give an idea of the extent of the work. I. Systematic Position and Structure. II. Some Habits of the Adults. III. How Far Mosquitoes Fly. IV. Mating. V. Larvæ and Pupæ. VI. Malaria. VII. Yellow Fever and Other Diseases. VIII. Mosquito Remedies and Enemies. IX. Notes on the Commoner Species. X. Collecting and Laboratory Methods. XI. Identification Keys and Systematic List.

Osburn, Raymond C. British Columbia Syrphidæ, New Species and Additions to the List. Canadian Entomologist, January, 1908. In this paper, 50 different species are mentioned, 6 of which are described as new. This article brings the list of British Columbian Syrphidæ up to 128 different species. It is pleasing to note that the large majority of the species were collected by local entomologists. This and Mr. Osburn's previous paper, (Can. Ent., Vol. XXXVI., Aug.-Sept., 1904), will make an excellent foundation for future work, in this family, for British Columbian dipterists.

Smith, John B. Notes on the Species of Amathes, Hbn., Philadelphia: Transactions, American Entomological Society, XXXIII., Nov. 1907; separate received Feb. 3, 1908. This paper, which treats of some of the North American species of noctuids in our lists under the genus *Orthosia*, is a welcome addition to the literature. Ten species of the genus *Amathes* have been found in Canada. This genus has the "Proboscis fully developed; palpi obliquely porrect, fringed with long hair in front, the 3rd joint short; frons smooth; eyes large, rounded; antennæ of male typically ciliated; head and thorax clothed with hair only; the tegulæ produced to a dorsal ridge, the pro- and metathorax without distinct crests; abdomen dorsally flattened, with lateral tufts of hair and some rough hair at base but without crests. Fore-wings with the termen evenly curved."

Smith, John B. A Revision of Some Species of Noctuidæ heretofore referred to the Genus Homoptera, Boisduval. Proc. U. S. Nat. Museum, Vol. XXXV., pp. 209-275, separates published November 10, 1908. This important contribution on the old genus Homoptera will be hailed with delight

by lepidopterists. There has been so much confusion in the genus, and it was previously very difficult, in many instances, to get exact determinations. Dr. Smith has gone into the subject very fully. Of the 25 species treated of, nine are recorded from Canada. In addition four other species occur in Canada, as mentioned in the *Ottawa Naturalist*, October, 1908. The old name Homoptera is replaced by Phœocyma of Hubner, an earlier name.

Van Duzee, E. P. Studies in North American Membracidæ. Bulletin of the Buffalo Society of Natural Sciences, Vol. IX., pp. 29-129; issued April 18, 1908. This publication will prove of much value to hemipterists. Most of the Membracidæ, or "tree-hoppers," are of uncommon occurrence, and for that reason, probably, the family has not been very much studied. The author gives tables of the sub-families, genera and species, and, at the end, a list of all species known to occur north of the southern boundary of the United States.

The following is a list of the names and addresses of collectors heard from during 1908:—

Anderson, E. M., Provincial Museum, Victoria, B.C.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Bethune, Rev. Prof., O. A. C., Guelph.
Boulton, A. R. M., c/o King Brothers, Quebec, Que.
Brodie, Dr. W., Provincial Museum, Toronto.
Bush, A. H., 1105 Ninth Ave., Vancouver, B.C.
Chagnon, Gus., Box 186, Montreal.
Cockle, J. W., Kalso, B.C.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Denny, Edward, 200 Mitcheson Street, Montreal.
Dent, W. A., Sarnia, Ont.
DeWolfe, L. A., Penticton, B.C.
Dod, F. H. Wolley- Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fletcher, James, Experimental Farm, Ottawa.
Fyles, Rev. T. W., Levis, Que.
Gibson, Arthur, Experimental Farm, Ottawa.
Groh, H., Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Halkett, A., Fisheries Museum, Ottawa.
Hanham, A. W., Duncans, B.C.
Harms, J. F., Treesbank, Man.
Harrington, W. H., P.O. Department, Ottawa.
Harvey, R. V., Victoria, B.C.
Heath, E. F., Cartwright, Man.
Hudson, A. F., Millarville, Alta.
Jarvis, T. D., O. A. C., Guelph.
Keele, Jos., Geological Survey, Ottawa.
Keen, Rev. J. H., Metlakatla, B.C.
Létourneau, Jos. A., Exp. Farm, Ottawa.
Lyman, H. H., 74 McTavish Street, Montreal.
Marmont, L. E., 2553 Second Ave. West, Vancouver, B.C.
McIntosh, W., St. John, N.B.

Metcalfe, W., 288 Bank Street, Ottawa.
Moore, W. H., Scotch Lake, N.B.
Moore, G. A., 209 Prince Arthur Street, Montreal.
Morris, Frank, Port Hope, Ont.
Nelles, Douglas H., Dept. Interior, Ottawa.
Perrin, Jos., McNab's Island, Halifax, N.S.
Ross, Ernest, Port Arthur, Ont.
Russell, John, Digby, N.S.
Sanson, N. B., Banff, Alta.
Saunders, Henry, 21 Harbord Street, Toronto.
Sherman, R. S., 2285 Sixth Ave., Vancouver, B.C.
Simpson, W., Dom'n Observatory, Ottawa.
Swaine, J. M., Macdonald College, Que.
Taylor, Rev. G. W., Departure Bay, B.C.
Tipping. E. Dalton, Bluff Centre, Alta.
Venables, E. P., Vernon, B.C.
Walker, Dr. E. M., 99 St. George St., Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Willing, T. N., Regina, Sask.
Wilmot, E. S., Vernon, B.C.
Wilson, W. J., Geological Survey, Ottawa.
Winn, A. F., 132 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.
Zavitz, E. J., O. A. C., Guelph, Ont.

NOTES OF CAPTURES.

Lepidoptera.

(Arranged according to Dyar's List of North American Lepidoptera, U.S.N.M. Bull. No. 52).

RHOPALOCERA.

(Dyar's number).

20. *Papilio indra* Reakirt, a. *nitra* Edw. Bluff Centre, Alta., (Tipping).
23. *Lærtias philenor* L. Grimsby, Ont., larva, Aug. 9, (J. W. Daniel).
92. *Euptoieta claudia* Cram. Toronto, "Humber Road, Old Mill," July, (Hahn).
104. *Argynnis electa* Edw. Hope Mts., B.C., not common, July 17, (Sherman).
134. *Brenthis triclaris* Hbn. Mer Bleue, near Ottawa, June 6, three specimens, (Young, Criddle, Gibson).
158. *Lemonias taylori* Edw. Hope Mts., several taken at summit, 5,800 feet, July 20, (Sherman, Harvey, Day).
189. *Phyciodes tharos* Dru. Hope Mts., July 21-23, (Sherman, Harvey, Day). A fine specimen of the aberration *packardii* Saund., was taken at the Mer Bleue, near Ottawa, by Mr. Young.
190. *Phyciodes batesii* Reakirt. On railway track, between Cache Bay and Beaver Meadow, Hull, Que., June 13. (Gibson).
223. *Junonia coenia* Hbn. Orillia, four specimens in two days. It looks as if this butterfly had become a permanent resident, (Grant). Toronto, August, (Miss F. Hahn).

271. *Erebia vidleri* Elwes. Hope Mts., July 20, (Day).
376. *Incisalia henrici* G. & R. A specimen of this butterfly taken at Montreal by the late Mr. Caulfield has recently been identified by Mr. Cook, who says it is the furthest northern record.
584. *Epargyreus tityrus* Fab. Cartwright, Man., one in garden, June 19, second appearance here, (Heath).

HETEROCERA.

678. *Pholus pandorus* Hbn. Ottawa, larva on Virginian Creeper, moth emerged July 8, (Gibson).
747. *Tropæa luna* L. Winnipeg, Man., June 1, (Wallis). Mr. Wallis also reports that a specimen of this rare moth was taken some years ago at Gall Harbour, (Miss Cowley).
836. *Utetheisa bella* L. Hyde Park, Ont., one specimen, end August, (J. F. Weir); Hymers, Ont., Sept. 19, (Dawson).
853. *Estigmene prima* Slosson. Winnipeg, June 2, two specimens, (Wallis).
861. *Phragmatobia assimilans* Wlk., a. *franconia* Slosson, Hymers, June 9, (Dawson).
868. *Neoarctia beanii* Neum. Larva from N. B. Sanson, found on Sulphur Mountain. Moth emerged at Ottawa, June 15, (Gibson).
872. *Hyphoraia parthenos* Harr. Ottawa, a fine specimen, at light, July 1, (Baldwin). Rare at Ottawa.
874. *Apantesis virgo* L., a. *citrinaria*, N. & D., Toronto, (Hahn).
888. *Apantesis nevadensis* G. & R., b. *superba* Stretch. Hope Mts., July 20, (Sherman). Penticton, B.C., (Wallis).
889. *Apantesis williamsii* Dodge, a. *determinata*, Neum., July 7, (Dawson), first Ontario record.
890. *Apantesis phyllira* Dru. Toronto, (Hahn).
1,000. *Apatela quadrata* Grt. Hymers, June 22, (Dawson); Orillia, (Grant). *Apatela inclara* Sm. Billings Bridge, Ottawa, (Fletcher). New record for district.
1,034. *Apatela perdita* Grt. Peachland, B.C., July 8, (Wallis).
1,047. *Apharetra pyralis* Sm. Aweme, Aug. 28, (E. Criddle).
1,075. *Baileya doubledayi* Gn. Ottawa, July 20, (Baldwin).
1,084. *Catabena lineolata* Wlk. Ottawa, July 20, (Baldwin). First record for the district.
1,088. *Platysenta videns* Gn. Cartwright, Man., one, July 4, always rare, (Health); Ottawa, June 6, (Gibson).
1,165. *Hadena diversicolor* Morr. Sudbury, (Evans).
1,176. *Hadena didonea* Sm. Trenton, (Evans).
1,216. *Hadena contradicta* Sm. Hymers, June 22, (Dawson). First record received for Ontario.
1,229. *Hadena alticola* Sm. Metlakatla, B.C., (Keen).
Hadena multicolor Dyar. Victoria, B.C.; May 22, (Harvey).
1,255. *Macronoctua onusta* Grt. Trenton, four specimens, Sept. 17, 18, 20, 25, (Evans). Larva again found at Ottawa, (Gibson).
1,341. *Oncocnemis atrifasciata* Morr. Hymers, Aug. 22, (Dawson).
Rhynchagrotis sambo Sm. Ainsworth, B.C., Aug. 3, 11, (Rev. G. H. Findlay); Kaslo, July and August, (Cockle); Peachland, July, (Wallis).
1,412. *Adelphagrotis stellaris* Grt. Victoria, July 26, (Anderson); Duncans, (Hanham).

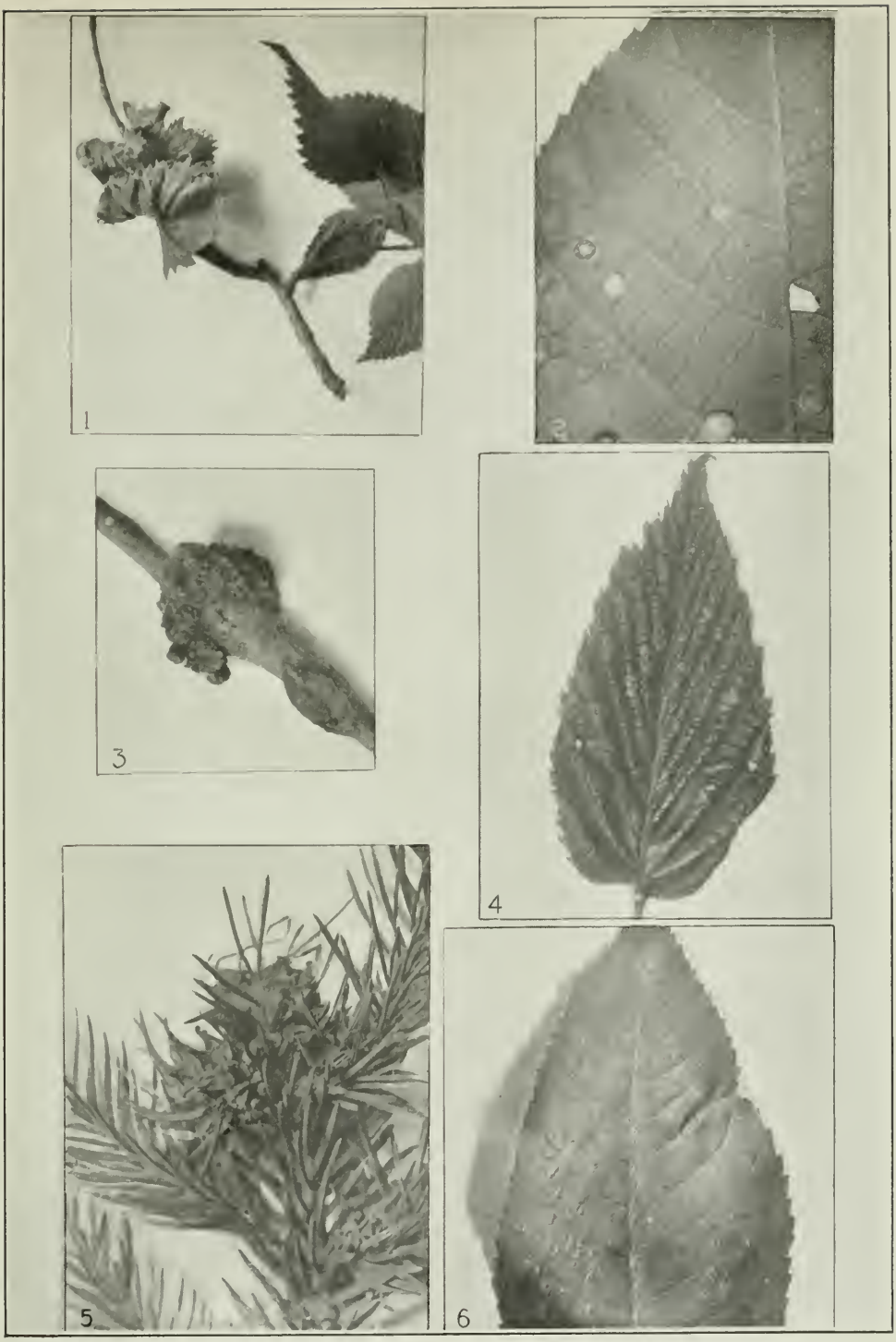

PLATE Q.

1. Schizoneura Americana, Ulmus Americana.
2. Phylloxera sp., Carya alba.
3. Schizoneura sp., Populus tremuloides.
4. Schizoneura sp., Alnus incana.
5. Chermes abietis, Picea excelsa.
6. Phylloxera caryaevena, Carya ovata.

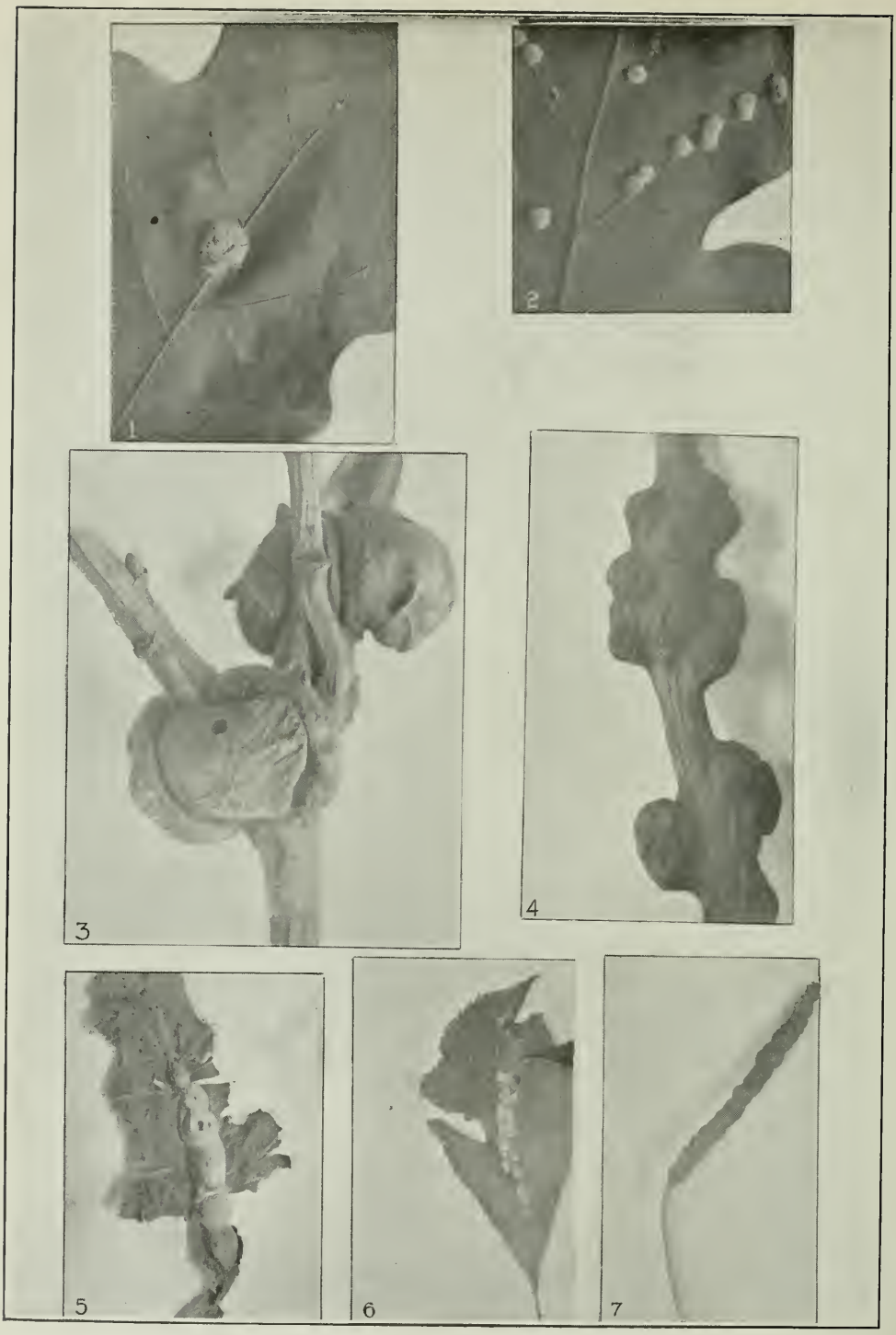

PLATE R.

1. Acraspis erinacei, Quercus alba.
2. Neuroterus floccosus, Quercus alba.
3. Andricus ventricosus, Quercus sp.
4. Aulax nabali, Prenanthes alba.
5. Gilletia taraxaci, Taraxacum officinale.
6. Cecidomyla holotricha, Carya ovata.
7. Strawberry Peticle gall Fragaria virginiana.

THE LATE JAMES FLETCHER, LL.D., F.R.S.C., F.L.S.

1,430. *Pachnobia monochromatea* Morr. Ottawa, July 3, (Young).
1,431. *Pachnobia littoralis* Pack. Hymers, June 22, (Dawson). Only Ontario record we have.
1,434. *Pachnobia wockei* Moeschl. Labrador, July 19, (Dr. A. P. Low).
Setagrotis dolens Sm. High River, Alta., (Baird).
1,455. *Agrotis geniculata* G. & R. Meach Lake, Que., near Ottawa, Aug. 31, (Fletcher); Truro, N.S., (DeWolfe); Toronto, (Gibson).
Rhizagrotis perolivalis Sm. High River, Aug. 25, (Baird).
1,544. *Feltia gladiaria* Morr. Trenton, (Evans). This is the first Canadian specimen we have seen.
1,600. *Paragrotis perfusca* Grt. Sudbury, Ont., (Evans).
1,682. *Paragrotis fuscigera* Grt. Olds, Alta., June 21, (Willing).
1,697. *Paragrotis dissona* Moesch. Aweme, Aug. 28, (E. Criddle).
Paragrotis cocklei Sm. Departure Bay, Aug. 7, (Young).
1,780. *Mamestra determinata* Sm. Trenton, at light, Aug. 27, (Evans).
1,783. *Mamestra detracta* Wlk. Trenton, July 31, (Evans).
1,789. *Mamestra capsularis* Gn. Among some noctuids named for Mr. Evans, was a specimen of this moth with the label "E. Ontario, Canada," on it. This is the first Canadian record we have.
1,797. *Mamestra gussata* Sm. Ottawa, April 24, (Young).
1,821. *Mamestra rugosa* Morr. Sudbury, (Evans).
1,825. *Mamestra goodellii* Grt. Peachland, B.C., July 18, (Wallis); Ottawa, July 24, (Saunders); Sidbury, (Evans); Mt. St. Hilaire, near Montreal, May 24, (Chagnon).
1,840. *Mamestra sutrina* Grt. Laggan, Aug. 4, (Fletcher).
1,894. *Xylomiges dolosa* Grt. Hymers, May 10, (Dawson).
2,024. *Graphiphora furfurata* Grt. Mt. St. Hilaire, near Montreal, July 2, (Chagnon). The true species (J. B. S.).
2,074. *Pleroma bonuscula* Sm. Victoria, (Fletcher). A new locality for the species, (J. B. S.).
2,108. *Xylina bayleyi* Grt. Duncans, B.C., April, (Day).
Hydræcia micacea Esp. Specimens of this moth have been reared in the Division from larvæ received from Mahone Bay, N.S., (C. A. Hamilton); Westport, N.S., (Geo. Welch), and Tramore, Ont., (Capel B. St. George). As mentioned in Mr. Gibson's paper, in this report, the above and specimens of the moth taken at St. John, N.B., by Mr. W. McIntosh, and recorded by him under the name of *Hydræcia medialis* Sm., are the only American records of this European insect.
2,214. *Tapinostola variana* Morr. Trenton, at light, Aug. 6, (Evans); Westbourne, Man., July 28, (Wallis).
Amathes duscata Sm. Aweme, Aug. 28, (E. Criddle).
Amathes acta Sm. Departure Bay, B.C., Sept. 5, (Young).
2,224. *Orthosia inops* Grt. Cartwright, Man., July 30, (Heath); Aweme, Aug. 25, (Fletcher); Aug. 30, (E. Criddle).
2,231. *Orthosia lutosa* Andrews, Peachland, B.C., July 6, (Wallis).
Orthosia verberata Sm. Bartlett Bay, off Glacier Bay, Alaska, June 10, (Nelles). A new locality for the species. (J.B.S.).
2,280. *Pippona bimatris* Harv. Aweme, (Fletcher). Quite a rare species. First Canadian record.
2,390. *Dasyspoudæa meadii* Grt. High River, Alta., (Baird).
2,423. *Heliaca nexilis* Morr. Several on summit of Hope Mts., B.C., July 20, (Harvey).

2,617. *Eustrotia includens* Wlk. Trenton, July 18, (Evans).

2,618. *Galgula hepera* Gn. and var. *partita* Gn. Mt. St. Hilaire, near Montreal, Aug. 30, (Chagnon). Mr. Winn has also taken the species at Montreal.

2,661. *Tarache terminimacula* Grt. Trenton, (Evans).

2,769. *Meliopotis limbolaris* Geyer. Lorne Park, Ont., July 25, (Williams).

2,830. *Catocala concumbens* Wlk. Metlakatla, B.C., (Keen); Fort Selkirk, Yukon, July, (Miss Seymour). Both of these records are of much interest; the latter is the most northern limit of *concumbens* known at the present time, (Beut.).

2,858. *Catocala coccinata* Grt. Westbourne, Man., Aug. 10, (Wallis).

2,871. *Catocala subnata* Grt. Billings Bridge, Ottawa, (Fletcher). First record for the district.

2,900. *Catocala præclara* G. & R., Digby, N.S., Sept. 17, (Russell).

Homoptera norda Sm. Chelsea, Que., near Ottawa, May 30, (Gibson); Ottawa, May 16, 18, (Young); Kaslo, (Cockle); Cartwright, (Heath).

2,900 *Homoptera minerea* Grt. Britannia, near Ottawa, June 20, (Baldwin). In the Entomological Record for 1906, this species is recorded from White River, Hudson Bay Slope, June 2, (Wilson). On further examination Dr. Smith could not confirm this identification, as the specimen was much rubbed and crushed.

2,991. *Homoptera calycanthata* S. & A. In the Entomological Record for 1904, this species is recorded from Kaslo. According to Dr. Smith's Revision of the Genus Homoptera, just published, this record should now refer to his new species *norda*.

3,000 *Homoptera unilineata* Grt. Winnipeg, June 2, (Wallis). Only Canadian record which we have.

3,002. *Homoptera duplicata* Bethune. As mentioned in the Ottawa Naturalist, Oct. 1908, the record of this moth having been taken at Wellington, B.C., (Taylor), should now refer to *largera* Sm. *Duplicata* has been taken at Digby, N. S., (Russell), and Truro, N.S., (DeWolfe).

Homoptera helata Sm. Britannia, near Ottawa, June 20, (Baldwin).

3,038. *Philometra hanhami* Sm. Trenton, Aug. 2, (Evans). An unexpected locality; all the specimens heretofore seen are from Winnipeg, (J.B.S.).

3,066. *Bomolocha bijugalis* Wlk. Cartwright, July 4; recorded previously from Winnipeg by Hanham, first I have taken, (Heath).

3,087. *Gnophœla latipennis* Bdv. Similkameen, B.C., July 22 and 24, (Sherman and Harvey).

3,317. *Eupithecia nevadata* Pack. Duncans, April, (Day).

Eupithecia quebecata Taylor MS. Digby, N.S., Sept. 19, (Russell); Rostrevor, Ont., Sept. 16, (Gibson). First Ontario record.

Eucymatoge togata Hbn. Digby, July 22, (Russell). Mr. Taylor says: "This is a specimen of the European *E. togata*, which I have placed on the American list. I have taken the species at Wellington, B.C. This Nova Scotian specimen is more typical than mine."

3,392. *Hydriomena speciosata* Pack. Departure Bay, B.C., Aug. 10, (Young).

Hydriomena manzanita Taylor. Goldstream, B.C., April 19, 1,000 feet, (Harvey).

Xanthorhœ fossaria Taylor. Victoria, May and June, (Harvey).

3,708. *Cymatophora wauaria* L. Mt. St. Hilaire, Que., June 30, (Chagnon).
3,747. *Sympherta tripunctaria* Pack. Departure Bay, Aug. 25, (Young).
3,799. *Alcis latifasciaria* Pack. Departure Bay, Aug. 22-28, (Young).
3,802. *Alcis latipennis* Hulst. Departure Bay, Aug. 3, (Young).
3,878. *Jubarella danbyi* Hulst. Duncans, April, (Day).
3,922. *Ennomos subsignarius* Hbn. As mentioned in the Ottawa Naturalist, Sept., 1908, enormous numbers of these moths visited Ottawa on July 23. Thousands appeared in all parts of the city.
4,040. *Leucobrephos brephoides* Wlk. Hymers, April 9, (Dawson). This is the first record we have for Ontario.
4,216. *Sesia pictipes* G. & R. Levis, Que., (Fyles).
4,221. *Sesia acerni* Clem. Ottawa, July 8, at light, (Fletcher).
4,496. *Nymphula obliteralis* Wlk. Larvæ found at Ottawa feeding on *Lemna trisula*, (Fletcher).
4,569. *Crambus bidens* Zeller. Aweme, Aug. 9, (Criddle); Mer Bleue, near Ottawa, July, (Young).
4,571. *Crambus trichusalis* Hulst. High River, (Baird); Regina, (Willing); Redvers, Sask., (A. J. Crocker).
4,608. *Crambus zeellus* Fern. Ottawa, July 15, (Gibson).
Crambus cockleellus Kearf. Kaslo, Aug. 10, 11, (Cockle).
Crambus dorsipunctellus Kearf. Rounthwaite, Man., July, (Marmont).
Crambus youngellus Kearf. Mer Bleue, near Ottawa, July 2-10, (Young).
Thaumatopsis gibsonella Kearf. Rostrevor, Ont., Sept. 2-16, (Gibson).
Eucosma annetteana Kearf. Cartwright, May 23, (Heath).
Eucosma medioviridana Kearf. Ottawa, Aug. 17-21, (Young).
5,239. *Ancylis mediofasciana* Clem. Cartwright, May 23, (Heath).
Enarmonia multilineana Kearf. Aweme, June 26, 29, (Criddle).
Gelechia terminimaculella Kearf. Aweme, June 13-16, (Criddle); Rounthwaite, June 15, (Marmont).
Gelechia alternatella Kearf. Aweme, May 12-25, (Criddle).
Colcophora elæagnisella Kearf. Ottawa. Larvæ abundant on *Elæagnus argentea*, moths emerged July, (Fletcher and Gibson).
6,257. *Lithocolletis lucidicostella* Clem. Ottawa, June 11, (Young).
6,301. *Lithocolletis basistrigella* Clem. Ottawa, bred from oak, March 11, (Young).
6,305. *Lithocolletis acericlla* Clem. Ottawa, June 16, (Young).
6,310. *Lithocolletis tilieacella* Chamb. Ottawa, July 17, (Young).
Lithocolletis fletcherella, Braun. Ottawa, bred from Oak, (Fletcher and Gibson).
Argyresthia laricella Kearf. Mer Bleue, near Ottawa, reared from terminal twigs of *Larix americana*, moths issued Ottawa, June 12-23, (Fletcher and Gibson).
6,608. *Hepialus hyperboreus* Moesch. Hymers, Ont., Aug. 23, (Dawson).
6,610. *Hepialus gracilis* Grt. Levis, (Fyles).

Coleoptera.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico).

18*c*. *Cicindela montana* Lec. Lethbridge, Alta., (Harms).
25*a*. *Cicindela audubonii* Lec. Lethbridge, April, (Harms).

25*d*. *Cicindela 10-notata* Say. Lethbridge, April, (Harms).
28. *Cicindela fulgida* Say. Westbourne, Man., Aug. 14, (Wallis). New to Manitoba.
32. *Cicindela vulgaris* Say. Lethbridge, (Harms).
33*c*. *Cicindela 12-guttata* Dej. Lethbridge, (Harms).
34. *Cicindela pusilla* Say. Westbourne, Aug. 14, seven specimens, showing great range of maculation from almost immaculate to very bright and evenly marked, (Wallis).
35. *Cicindela hirticollis* Say. Lachute, Que., Aug. 3, (Criddle and Fletcher).
119*c*. *Carabus oregonensis* Lec. Westbourne, Aug. 19, (Wallis).
148*b*. *Calosoma zimmermanni* Lec. Lethbridge, (Harms).
208. *Promecognathus lævissimus* Dej. Goldstream, B.C., 1,110 feet, July 4, (Harvey).
Amara thoracica Hayward. Mr. Evans has sent in the following record: 1 specimen collected by John Macoun in the N. W. T., in 1880.
990. *Zacotus matthewsii* Lec. Victoria, B.C., Feb. 20, (Harvey).
1,081. *Harpalus amputatus* Say. Vernon, Aug. 18, (Harvey). New to British Columbia.
1,102. *Harpalus innocuus* Lec. Vancouver, May 1, (Harvey).
1,404. *Matus bicarinatus* Say. St. Lambert, Que., Aug., (Chagnon).
1,465. *Rhantus notatus* Fab. Winnipeg, Sept. 11, (Wallis).
1,467. *Rhantus tostus* Lec. Winnipeg, July 24, Aug. 8, (Wallis).
1,482. *Dytiscus hybridus* Aubé. Winnipeg, May 24, (Wallis).
1,483. *Dytiscus verticalis* Say. Mahone Bay, N.S., May 20, (Miss Blanche Colp). Record sent by Dr. C. A. Hamilton, of Mahone Bay.
1,485. *Dytiscus sublimbatus* Lec. Winnipeg, May 8, (Wallis).
1,486. *Dytiscus marginalis* L. Winnipeg, May 8, (Wallis).
1,499. *Graphoderes cinereus* L. Winnipeg, July 4, (Wallis).
1,585. *Hydrophilus ovatus*, G. & H. Ottawa, at light, May 12, (Fletcher).
1,629. *Philhydrus bifidus* Lec. Winnipeg, Aug. 20, (Wallis).
2,627. *Tachinus crotchii* Horn. Vancouver, March 23, (Harvey).
3,074. *Mysia hornii* Cr. Vernon, (Venables).
3,076. *Anatis rathvoni* Lec. Victoria, April 11, (Harvey).
3,402. *Triphyllus humeralis* Kirby. Found in large numbers, near Montreal, in fungus, early May. Mr. Fall tells me that this belongs to the Malandryidæ and should be transferred to that family, (Chagnon).
Exoma pleuralis Casey. Metlakatla, B.C., (Keen).
4,001. *Helodes apicalis* Lec. Vancouver, April 14, (Harvey).
4,011. *Cyphon brevicollis* Lec. Wellington, April 17, (Harvey).
4,029. *Stethon pectorosus* Lec. Ste. Anne de Bellevue, Que., several found by Mr. Swain and me, in July, under bark of fallen tree, (Chagnon).
4,068. *Sarpedon scabrosus* Bonv. Vancouver, (Harvey). New record for British Columbia. Two specimens of this rare beetle were taken many years ago at Ottawa, (Harrington and Fletcher).
4,105. *Cardiophorus fenestratus* Lec. Vancouver, April 28; Victoria, July 8, (Harvey).
4,440. *Corymbites protractus* Lec. Vancouver, April 28, (Harvey). New to British Columbia.
4,450. *Corymbites tarsalus* Melsh. Vancouver, April 27, (Harvey). New record.

4,506. *Asaphes oregonus* Lec. Goldstream, July 4, (Harvey).
4,568. *Chalcophora angulicollis* Lec. Near Princetown, B.C., July 23, (Harvey).
5,467. *Aegiolia cylindrica* Esch. Vancouver, April 14, (Harvey).
5,528. *Aphodius granarius* L. Vancouver, May 9, (Harvey). New record.
5,923. *Cremastochilus pilosicollis* Horn. Vernon, in ants' nests in early spring, (Venables).
6,174. *Calloides nobilis* Say. Wakefield, Que., on oak, July 7, (Gibson).
6,223. *Desmocerus cribripennis* Horn. Hope Mts., B.C., July 17, (Sherman).
6,246. *Toxotus obtusus* Lec. Vernon, (Venables).
6,323. *Leptura instabilis* Hald. Vernon, on lupin, June, (Venables).
6,323*a*. *Leptura convexa* Lec. Vernon, on lupin, June, (Venables).
6,340. *Leptura quadrillum* Lec. Grouse Mt., Vancouver, B.C., July 9, (Sherman).
6,556. *Zeugophora consanguinea* Cr. Vernon, (Venables).
Acanthocinus aedilis S. A specimen of this fine European beetle was found at Ottawa among some packing in a box of chinaware received from Germany, (R. B. Whyte).
6,560. *Syneta simplex* Lec. Vancouver, Aug. 2, (Harvey). New record for British Columbia.
6,968. *Haltica evicta* Lec. Nicolum R., B.C., July 13, (Harvey).
6,988. *Epitrix subcrinita* Lec. Vernon, (Venables).
7,396. *Cœlocnemis dilaticollis* Mann. Penticton, B.C., (Mrs. Fowler). Record sent by Mr. Wallis.
7,721. *Rhinosimus aneirostris* Mann. Vancouver, April 14, (Harvey).
7,724. *Calopus angustus* Lec. Duncans, in a spider's web, March 15, (Hanham).
8,158. *Cantharis sphæricollis* Say. Princetown, B.C., July 22, (Harvey).
8,438. *Lepyrus geminatus* Say. Hope Mts., July 21, (Harvey).
8,543. *Erycus punctipennis* Lec. Under rotten logs on shore of Long Lake, March 31; on leaves of wild raspberry, same place, May 24, (Venables).
9,942. *Hister umbrosus* Casey. Vernon, under carrion, (Venables).
9,944. *Hister electus* Casey. Wellington, July 2, (Harvey). New record.
11,073. *Cryptorhynchus lapathi* L. Durndurn, Sask., in Carolina poplar. end May, (Dr. W. A. Wilson).

Diptera.

(Arranged according to a Catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI., No. 1,144. The numbers refer to the pages of the catalogue.)

92. *Eriocera longicornis* Walk. Mamamattawa River, Hudson Bay Slope, June 21; Little Current River, Hudson Bay Slope, July 8; Nagagami River, Hudson Bay Slope, June 20, (Wilson).
Anopheles occidentalis D. & K. Negagami R. 7th portage, June 7, (W. J. Wilson).
131. *Aedes sylvestris* Theob. Ottawa, June 20, 1901; June 18, 19, 1906, (Fletcher).
Aedes riparius, D. & K. Winnipeg, (F. Knab); Ottawa, June 11, (Fletcher).
Aedes campestris D. & K. Regina, June 14, 15; Carnduff, May 28; Qu'Appelle, June 9, (Willing).

131. *Culex restuans* Theob. Ottawa, Aug., Sept., (Fletcher).
133. *Tæniorhynchus perturbans* Wlk. Ottawa, June 20, July 1, (Fletcher).
167. *Dilophus breviceps* Loew. Mamamattawa River, June 21, (Wilson).
169. *Simulium bracteatum* Coq. Vancouver, April 24, (Harvey).
196. *Chrysops discalis* Will. Maple Creek, Sask., June 12, (Willing).
Chrysops lupus Whitney. Youghall, N.B., July 27, (Fletcher).This is of interest as it had not been taken so far east before, (J. S. H.).
202. *Tabanus carolinensis* Macq. Ottawa, May 20, (Fletcher).
203. *Tabanus epistates* O.S. Meach Lake, Que., near Ottawa, June 18, (Fletcher).
204. *Tabanus illotus* O.S. Megiskon River, Ont., July, (Wilson).
204. *Tabanus insuetus* O.S. Prince Albert, Sask., July 27, (Fletcher).
Tabanus osburni Hine. Banff, Aug. 2, (Fletcher).
206. *Tabanus punctifer* O.S. Vernon, July 11, (Venables).
207. *Tabanus septentrionalis* Loew. St. Albert, Alta., July 20, (Fletcher).
217. *Atherix variegata* Walk. Mamamattawa River, June 21, (Wilson).
Cophura albosetosa Hine. Hope Mts., B.C., July 19; Similkameen, July 20, (Harvey and Sherman).
Anthrax harveyi Hine. Hope Mts., July 20-23, (Sherman and Harvey).
236. *Bombylius lancifer* O.S. Bowen Island, Vancouver, B.C., May 24, reported by R. V. Harvey. First record for Canada, (J.S.H.).
236. *Bombylius metopium* O.S. Hope Mts., July, (Harvey). First record for Canada, (J.S.H.).
281. *Machimus avidus* Van der Wulp. Victoria, July 22, (Harvey). First record for Canada, (J.S.H.).
282. *Asilus angustifrons* Will. Goldstream, Vancouver Island, Aug, 20, (Harvey). First record for Canada, (J.S.H.).
347. *Chrysotoxum derivatum* Walk. Hope Mts., July 20, (Sherman).
348. *Chrysotoxum ypsilon* Will. Banff, Alta., one specimen, (Sanson). I recently recorded the first record for Canada from a specimen taken at Kaslo, B.C., in 1903, by Dr. Dyar. This Banff record is the first east of the Great Divide, and bears testimony to what I have written once or twice, that the various species of insects find distribution over the Divide much easier in Canada than in the Rockies further South. (R.C.O.).
361. *Melanostoma kelloggi* Snow. Mer Bleue, near Ottawa, June 19, (Fletcher).
Xanthogramma tenuis Osburn. Ottawa, Sept., (Fletcher). This is an exceptionally good find, (R.C.O.). The species was described in Can. Ent., Jan., '08, from a specimen taken in the Hope Mts., by Mr. R. V. Harvey.
367. *Syrphus pauxillus* Will. Gabriola Island, B.C., June 6, (B. R. Elliott).
Syrphus insolitus Osburn. Victoria, one pair, April 18, (Harvey).
385. *Eristalis compactus* Walk Banff, one specimen, (Sanson). Only one previous record for Canada, at Martin Falls, the type, (R.C.O.).
387. *Eristalis occidentalis* Will. Regina, June 18, (Willing). Much farther east than ever before recorded. I have specimens from Banff, the farthest eastern record previously, (R.C.O.).

389. *Eristalis transversus* Weid. Little Current River, July 16, (Wilson).

400. *Chrysochlamys cræsus* O.S. Victoria, B.C., July 1, one specimen, (Hanham); Goldstream, B.C., July 4, (Harvey). I recently published the first record for Canada based on a specimen taken by Harvey at Victoria, 8, VI., '06, (R.C.O.).

Specomyia occidentalis Osburn. Gabriola Island, June 6, (B. R. Elliott).

572. *Helomyza limbata* Thom. Grouse Mt., July 9, (Sherman). First record for Canada, (J.S.H.).

Hymenoptera.

In last year's Record mention was made of some Bombi which had been determined by Mr. H. J. Franklin. During the past year further collections of these insects have been examined by Mr. Franklin, and from a complete list of the species named by him, the following are thought worthy of mentioning here. Unfortunately, little work seems to have been done in the important order of hymenoptera in Canada during the year, consequently very few other records have been received.

Bombus praticolus Kirby. St. Albert, Alta., (Fletcher); Metlakatla, B.C., (Keen).

Bombus mixtus Cress. Metalakatla, (Keen); Mt. Cheam, B.C., (Fletcher); Banff, Alta., (Sanson).

Bombus appositus Cress. Kelowna, B.C., (Fletcher).

Bombus edwardsii Cress. Mt. Arrowsmith, B.C., Duncans, B.C., (Fletcher); Banff, (Sanson).

Bombus kirbyellus Curtis. Bartlett Bay, Alaska, at sea level, (Nelles). One of the rarer species (H.J.F.).

Bombus borealis Kirby. Beaver Lake, Alta., (Halkett). Not a very common species, (H.J.F.).

Bombus sitkensis Nylander. Mt. Cheam, (Fletcher); Skagway District of Northern British Columbia, (G. White-Fraser).

Bombus californicus Smith. Olds, Alta., (Willing); Duncans, (Fletcher). Not very common in western Canada; not present in eastern Canada, (H.J.F.).

Bombus nigroscutatus Franklin MS. Skagway District of Northern British Columbia, (G. White-Fraser). Apparently rare in Western Canada; not present in eastern Canada, (H.J.F.).

Bombus terrestris, var. *moderatus* Cress. Banff. (Sanson). Rare in Western Canada; not present in the east, (H.J.F.).

Bombus couperi Cress. Nepigon, (Fletcher); Anticosti, (Dr. Jos. Schmitt). One of the rarer species, (H.J.F.).

Bombus rufocinctus Cress. Ottawa, Sept. 20, (Fletcher); Radisson, Sask., (Fletcher). This species is rare in eastern Canada, and extremely variable in colouration, (H.J.F.).

Bombus vagans Smith. Rostrevor, Muskoka, Ont., Sept., (Gibson); Regina, Sask., Banff, (Fletcher); Westbourne, Man., Aug. 26, (Wallis).

Bombus virginicus Oliv. Mer Bleue, near Ottawa, June 6, (Gibson).

Psithyrus consultus, Franklin, MS. Nelson, B.C., Mt. Cheam, Regina, (Fletcher).

Psithyrus suckleyi, Greene, Duncans, Banff; Mt. Arrowsmith, (Fletcher).

Prosopis basalis, Smith. Winnipeg, June 10, (Wallis).

Pompilus terminatus, Say. Penticton, B. C., Aug., (Miss B. Farmer).
Ichneumon feralis, Cress. Winnipeg, Aug. 23, (Wallis).
Ichneumon caliginosus, Cress. Westbourne, Man., Aug, 24, (Wallis).
Ichneumon acerbus, Cress. Treesbank, Man., April 17, (Wallis).
Rhyssa persuasoria, L. Hymers, Ont., Sept. 6, (Dawson).
Ephialtes gigas, Walsh. Hull, Que., June 13, (Gibson).
Thyreodon morio, Fab. Stonewall, Man., July, (Wallis).
Macrophya oregona, Cress. Hope Mts., July 17, (Harvey).
Tenthredo melanosoma, Hartg. Hope Mts., July 17, (Harvey).

Hemiptera.

Several collectors have, during the year, given special attention to the hemiptera. Most of the species mentioned below were identified by Mr. E. P. Van Duzee. The Ottawa species, probably none of which are very rare, are included as they are the only records we have for the district.

Telamona reclivata, Fitch. Ottawa, July 14, (Metcalfe); Sept. 2, on basswood, (Groh).
Telamona ampelopsides, Harr. Ottawa, July 14, (Gibson).
Cyrtolobus vau, Say. Ottawa, June 29, on red oak, (Fletcher).
Cyrtolobus griseus Van D. Ottawa, on oak, Aug. 25, (Metcalfe).
Scolops sulcipes, Say. Ottawa, Sept. 5, on Goldenrod, (Groh).
Liburnia foveata, Van D. Mer Bleue, near Ottawa, June-Sept., (Metcalfe).
Aphrophora signoretii, Fitch. Regina. Sask., Aug. 8, (Fletcher).
Bythoscopus pruni, Prov. Ottawa, June 21, (Gibson).
Gypona flavilineata, Fitch. Ottawa, Sept. 7, (Gibson).
Gypona scarlatina, Fitch. Wakefield, Que., July 7, (Gibson).
Gypona albosignata, Uhl. Trenton, Ont., Sept. 1, (Evans).
Deltocephalus abdominalis, Fab. Near 60 Mile River, along 141 Meridian, Yukon Territory, (P. Reilly).
Phlepsius irroratus, Say. Ottawa, Oct. 8, (Fletcher).
Athysanus extrusus, Van D. N.W.T., 1881, (John Macoun); record sent by J. D. Evans.
Dorycephalus platyrhynchus, Osborn. Aweme, Man., July 13, (Fletcher).
Typhlocyba bifasciata, G. & B., Ottawa, June 22, (Gibson).
Cicadula 6-notata, Fall. Ottawa, on aster, Aug. 31, (Fletcher).
Thyreocoris unicolor, P. B. Aylmer, Que., in pappus of *Sonchus arvensis*, Aug. 29, (Groh).
Eurygaster carinatus, Van D. Vernon, B. C., June 6, (Venables).
Carpocoris remotus, Harvath. Vernon, Aug. 12, (Venables).
Brochymena affinis, Van D. Peachland, B. C., June 27, (Wallis).
Leptoglossus occidentalis, Heidemann MS. Vernon, B.C., Sept. 27, (Venables).
Nysius scolopax, Say. Vernon, (Venables).
Geocoris decoratus, var. *solutus* Mantodon. Ottawa, June 4, (Fletcher).
Geocoris limbatus, Stal. Mer Bleue, near Ottawa, uncommon, (Metcalfe).
Geocoris uliginosus, var. *limbatus*, Stal. Vernon, Sept. 4, (Venables).
Lygus monachus, Uhl. Ottawa, on basswood, July 1, (Metcalfe).
Lygus tenellus, Uhl. MS. Ottawa, on basswood, June 25, (Gibson).
Lygus invitus, Say. Ottawa, on basswood, June, (Metcalfe).
Calocoris bipunctatus, Fab. Annapolis Royal, N.S., (V. A. Eaton).

Neoborus pettiti, Uhl. MS., Ottawa, on white ash, Aug., (Metcalfe).

Neoborus saxeus, Dist. Ottawa, on white ash, Aug., (Metcalfe).

Plagiognathus obscurus, Uhler, Aylmer, Que., near Ottawa, Aug. 29, (Groh).

Triphleps tristicolor, White. Ottawa, Dec. 6, (Fletcher).

Gerris sulcatus, Uhl. Beaver Meadow, Hull, Que., May; Toronto, April, (Metcalfe).

Gerris rufoscutellatus, Latr. Ottawa, May; Toronto, April 1, (Metcalfe).

Acanthia ligata, Say. Little Current River, Hudson Bay Slope, July 11, (Wilson).

Corythuca marmorata, Uhl. Ottawa, rare, June, (Metcalfe).

Microvelia americana, Uhl. Beaver Meadow, Hull, May, (Metcalfe).

Acanthia humilis, Say. Ottawa, (Metcalfe).

Acanthia confluens, Say. Ottawa, (Metcalfe).

Acanthia reperta, Uhl. Ottawa, (Metcalfe).

Acanthia signoretii, Guer. Ottawa, (Metcalfe).

Ranatra quadridentata, Stal. Pickerel point on Ottawa River, near Ottawa, July, (Metcalfe).

Ranatra kirkadyi, Bueno. Ottawa, (Metcalfe).

Hydrometra martini, Kirby. Ottawa River, Pickerel Point, July, (Metcalfe).

Orthoptera.

During the year some good work has been done in this important order. Dr. E. M. Walker writes: "I have examined some 800 specimens from the Prairie Provinces and British Columbia, collected chiefly by Messrs. T. N. Willing and N. Criddle, Prof. W. J. Alexander and the late Dr. Fletcher. These will form the basis of a paper which I have about completed. Besides this material I have yet to report on collections made at Go Home, Georgian Bay, the Temagami region, Fort William and Nepigon, Ont."

The following records have been sent in by Dr. Walker as worthy of being included here: —

Nomotettix cristatus (Scudd.). Go Home, Georgian Bay, June-July, 1907, (Walker).

Tettix acadicus, Scudd. Temagami, Sept, 1908; Fort William, Aug. 1907, 1 female (Walker); Aweme, Man., May-June, 4 males, 5 females (Criddle).

Tettix brunneri, Bol., Temagami, Sept., 1908, 1 male, long-winged, (Walker).

Platybothrus brunneus, (Thom.). Regina, Sask., June 5, 1903, 1 male, (Willing).

Encoptolophus parvus, Scudd. Aweme, Sept. 6, 1907, 1 male, (Criddle); Walsh, Sask., Aug. 23, 1901, 4 males, 12 females; Regina, Sept. 19, 1903, 1 female, (Willing).

Hippiscus neglectus, (Thom.). Aweme, July 14, 1904, 2 females, (Criddle).

Circotettix undulatus, (Thom.). Cowley, Sask., July 29, 1901, 1 female; Medicine Hat, Oct. 1, 1903, 1 female, (Willing).

Circotettix carlinianus, (Thom.). Maple Creek, Sask., Aug. 2, 1902, 1 female, (Willing).

Melanoplus angustipennis, (Dodge.). Aweme, Aug. 18, 1906, 1 male, (Criddle).

Melanoplus angustipennis coccineipes, Scudd. Aweme, July, Aug., Oct., 1904-07, 4 males, 1 female, (Criddle).

Melanoplus foedus, Scudd. Swift Current, Sask., Aug. 5, 1901, (Willing).

Phoetaliotes nebrascensis, (Thom.). Walsh, Sask., Aug. 23, 1901, 1 short-winged female, teneral, (Willing).

Oecanthus quadripunctatus, Beut. Aweme, Aug-Sept., 1904, 2 males, 2 females, (Criddle).

ODONATA.

Some interesting collections of these insects have been made in 1908, and much material collected in previous years, has been gone over and carefully identified. Dr. E. M. Walker has been most helpful in naming material, and we are all very grateful to him for his continued kindnesses. Dr. Walker says: "In the Odonata, about 400 specimens from the Prairie Provinces have been examined. These were taken by Messrs. Willing, Criddle, Alexander, Fletcher, and Wallis. A list of these will give a fair idea of the Odonata fauna of this region, which is at present a *terra incognita* in this order. A considerable number of species was also collected by Mr. A. G. Huntsman, of the Biological Department, University of Toronto, at the new marine Biological Station on Vancouver Island, B.C. A good deal of material from the East has also been gone over. It comprises collections from the vicinity of Sault Ste. Marie, belonging to Mr. E. B. Williamson, of Bluffton, Ind., from Georgian Bay, Fort William, Nepigon and Temagami, made by the writer, and from Youghall, New Brunswick, by Mr. Arthur Gibson."

Dr. Walker has provided the following records:—

Lestes congener, Hagen. Aweme, Man., Aug. 29, 1907, 1 male, (Criddle); Westbourne, Man., July-Aug., 5 males, 6 females, (Wallis).

Nehalennia irene, Hagen. Westbourne, Man., July 27-29, 1908, 1 male, 2 females; Winnipeg, July 7, 1908, 1 male, 1 female, (Wallis).

Agrion lunulatum, Evans. Aweme, July 4, 1905, 1 male, (Criddle); Winnipeg, July 6, 1908, 1 male, (Wallis); Carnduff, June 18, 1905, 1 male; Regina, 2 males, 1 female, (Willing). This is the first time this Old World species has been reported from North America. I had thought it a new species, but Mr. K. J. Morton, of Edinburgh, Scotland, who has specimens from Redvers, Sask., pointed out to me its true relationship. The Canadian specimens differ slightly from European ones with which they have been compared and may be distinct, but more material will be necessary to determine the point (E. M. W.).

Agrion resolutum, Hagen. Youghall, N.B., July 20, 1908, 1 male, (Gibson); Little Carp River, Algoma, Ont., June 29, July 6, 1907, 5 males, 2 females, (Donaldson); Winnipeg, Man., July 7, 1908, 1 male, (Wallis).

Enallagma civile, Hagen. Winnipeg, July 9, 24, 1 male, 1 female, (Wallis).

Aeshna sitchensis, Hagen. Westbourne, Aug. 19, 1 male, (Wallis).

Aeshna constricta, Say. Westbourne, July 29, Aug. 26, 1 male, 3 females. This is the extreme northwestern limit of this species' range, so far as known, (E. M. W.).

Somatochlora forcipata, Scudd. Silver Creek Falls, Algoma, July 9, 1907, 1 male, (Donaldson).

Cordulia shurtleffi, Scudd. Silver Creek Falls, July 9, 1907, 1 male, (Donaldson); Youghall, N.B., July 18, 1 male, (Gibson).

Leucorhinia borealis, Hagen. Aweme, July 15, 1907, 1 female, somewhat teneral, (Criddle). This species is but little known and is represented in very few collections. The determination was verified by Dr. Calvert, (E. M. W.).

Neuropteroid Insects. (Except Odonata.)

During the year some small collections of neuropteroid insects have been submitted to specialists. The names of some of the species have been received; others have not yet been reported upon. The species mentioned as having been collected by Mr. W. J. Wilson, of the Geological Survey, Ottawa, were taken in the Hudson Bay Slope, and, through the courtesy of Dr. L. O. Howard, have been recently identified by Dr. Nathan Banks, who also examined Mr. Wallis' specimens. The numbers below refer to the pages in Dr. Banks' catalogue published in 1907 by the American Entomological Society.

Archiptera.

10. *Pteronarcys regalis* Newm. Winnipeg, June 1, (Wallis).
11. *Isogenus frontalis*, Newm. Kabina Kagami River, Aug. 1, (Wilson).
13. *Isoperla bilineata*, Say. Little Current River, July 16, (Wilson).
13. *Isoperla ebria* Hag. Treesbank, Man., June, (E. Ellis).
14. *Nemoura perfecta*, Walk. Little Current River, July 20, (Wilson).
15. *Capnia vernalis*, Newp. Mamamattawa River, June 21, (Wilson).

Neuroptera.

21. *Chauliodes californicus*, Walk. Kaslo, B.C., July 27, (Cockle).
22. *Sialis infumata*, Newm. Little Current River, July 16, (Wilson); Norman, Ont., July 19, (Wallis).
33. *Panorpa rufescens* Ramb. Winnipeg, July 1, (Wallis).
34. *Boreus californicus*, Pack. Kaslo, on snow, (Cockle), Banff, (Sanson).

Tricoptera.

35. *Phryganea improba*, Walk. Westbourne, Man., Aug. 5, (Wallis).
36. *Glyphotælius hostilus*, Hag. Kabina Kagami River, Aug. 1, (Wilson).
36. *Limnephilus indivisus*, Walk. Westbourne, Aug. 17, (Wallis).
36. *Limnephilus extractus*, Walk. Westbourne, Aug. 20, (Wallis).
Limnephilus moestus, Banks. Westbourne, Aug. 20, (Wallis).
37. *Limnephilus ornatus*, Banks. Winnipeg, June 19, (Wallis).
37. *Anabolia bimaculata*, Walk. Westbourne, Aug. 1, (Wallis).
37. *Colpotaulius medialis*, Banks. Westbourne, Aug. 20, (Wallis).
37. *Colpotaulius perpusillus*, Walk. Westbourne, Aug. 20, (Wallis).
38 *Pycnopsyche similis*, Banks. Kabina Kagami R., Aug. 11, (Wilson).
42 *Brachycentrus fuliginosus*, Walk. Nagagami R., Station 52, June 23, (Wilson).
45. *Leptocerus resurgens* Walk. Westbourne, Aug. 1, (Wallis).
46. *Œcetina avara* Banks. Westbourne, July 28, (Wallis).
47 *Hydropsyche cockerelli*, Banks. Nagagami R., June 6, (Wilson).

ARANEIDA.

Among some insects brought back from the Hudson Bay Slope in 1903 by Mr. W. J. Wilson, of the Geological Survey, Ottawa, was a small collection of spiders. These have recently been kindly named by Dr. Banks, through Dr. Howard. Owing to the northern locality at which the specimens were collected the list is given in full.

Epeira silvatica, Em. Kabina Kagami River, Aug. 11.
Epeira patagiata, Clerck. Mamamattawa River, June 21.
Gnaphosa conspersa, Th. Nagagami River, June 15.
Amaurobius bennetti, Blk. Nagagami R., June 6.
Tetragnatha extensa, L. Little Current River, July 16.
Lycosa pratensis, Emer. Kabina Kagami River, Aug. 11.
Lycosa kochi, Keys. Kenogami River, July 2.
Agræca pratensis, Emer. Kabina Kagami River, Aug. 9.
Agalena nævia, Htz. Little Current River, July 17.

INSECTS OF THE YEAR 1908 AT OTTAWA.

BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

The season of 1908, at Ottawa, has been a remarkable one, owing to the long continued drought. The months of June, July, August and September were particularly dry, the rain fall from the end of May till the beginning of October being only 6.80 inches. Vegetation consequently suffered very severely, but insects were more plentiful than usual and some serious outbreaks occurred.

Early in the season Cankerworm larvæ were abundant, their attacks being specially noticed on basswood, beech and birch. These insects seem to be on the increase again. The injury ceased about the 15th June, after which date very few caterpillars were noticed.

The American Tent Caterpillar, *Malacosma americana*, Fab., is also on the increase. On May 16th the work of the young caterpillars was very conspicuous on many trees near the city. On May 30th a large number of the nests were noticed at Chelsea, Que., about 7 miles from Ottawa. At that date some small wild cherry trees were almost stripped of their foliage.

On the same date at Chelsea, I found a nest of caterpillars of *Archips fervidana* on red oak. The nest was rather conspicuous, being several leaves drawn together somewhat in the shape of a ball. The caterpillars were all inside. This insect is better known in the United States where it has been recorded as destructive to several kinds of oak. In the Ottawa district it has never appeared commonly. When mature the caterpillar is nearly an inch long, of a yellowish-green colour, with the head and thoracic shield black. Moths from the above larvæ emerged on July 20th.

The Turnip Flea Beetle, *Phyllotreta vittata*, Fab. This small, very active, shining, black beetle was very troublesome in many gardens. The beetles did much harm to young turnips and were also very destructive to the first sowing of radishes. Where Paris green and land plaster, or Paris green and flour, were dusted on the plants, one pound of the former to 20 of the latter, the injury was soon stopped.

Root Maggots were more abundant than in 1907. The flies of the Radish Maggot were noticed flying around the young plants on May 16th. About the middle of June many plants examined were seen to be infested.

Unfortunately there is nothing new in the way of a remedy, that we know of, for these very destructive insects. For radishes preparations con-

taining carbolic acid, applied once a week after the plants appear above ground, until they are ready for the table, have given about the best results.

The Hessian Fly, *Mayetiola destructor*, Say., was present, in the district, in destructive numbers in spring wheat. Plants were noticed to be infested about the end of May, and in some places the attack was quite serious. On the Central Experimental Farm, in fields where the soil was poor and where the unfavourable weather conditions had weakened the plants, probably as many as 50% were infested by the Hessian Fly. In other fields where the soil was better, the plants were stronger and better able to withstand the unfavourable conditions of the season, and in these fields the loss from Hessian Fly would amount to about 5%. From collected material, both sexes of the flies emerged in the Division on June 20th, 22nd and 23rd.

For some years we have noticed at Ottawa, that the young leaves of spinach were fastened together at the tips of the shoots by a small lepidopterous larva. This year we made some observations on the insect and were successful in rearing the moths, specimens emerging on July 18th. It is one of the micros and we hope soon to have its determination. During the present year the insect was particularly abundant, and in my own garden, and one or two others which I visited, it practically rendered every plant unfit for use.

Sparganothis flavibasana, Fern. This interesting and rare tortrix was again destructive to the Caprifolium group of Lonicera in the Arboretum and Botanic Garden of the Central Experimental Farm. The larvæ were quite numerous on some of the bushes. In 1907, however, they were in much greater numbers and did very noticeable damage. The caterpillar draws together the upper pair of leaves, fastening the same along the edges, so that the newly formed berries and itself are within this tent-like structure. Their presence on a bush is thus easily detected. The injury is done chiefly to the cluster of young berries, or immature fruit, which is eaten, and among which the caterpillar makes a web of whitish silk. In 1907, the larvæ were plentiful on June 19th, and many specimens were collected by Mr. Kearfott and me, from which moths were reared on July 2nd to July 6th. This year larvæ were collected on June 6th, from which we got moths on June 27, 29, 30 and July 9. Pupæ were also found where the larvæ had been feeding. When mature the caterpillar is 15 mm. long when at rest, 17 mm. long when extended. It is cylindrical in shape, bright apple green in colour, and the segments are wrinkled. Dorsal vessel distinct. No markings on the skin. The head is black and shining. The thoracic shield is black, margined in front with white. Tubercles on body are inconspicuous, each bearing a single pale, slender, hair. The feet are all concolorous with the body.

Eriophyes species. The small pocket galls of the genus *Eriophyes* were very noticeable during the past season. The foliage of elm, basswood, maple and wild cherry were particularly disfigured by the work of these mites. Basswood trees were examined on June 12th and were found to be heavily infested by *Eriophyes abnormis*, Garm. Quite a few of the galls were on the under side of the leaves. The leaves of the soft maples, at Ottawa, have been much disfigured of late years by the galls of *Eriophyes quadripes*, Shimer.

At an excursion of the Ottawa Field-Naturalists' Club, held to the Mer Bleue, and nearby vicinity, on June 20, some interesting material was collected. The Mer Bleue is an extensive peat bog, about 12 miles from Ottawa, and is one of the best hunting grounds which we have in the district. The small, curious caterpillars of the plume moth, *Pterophorus eupatorii*, Fern.,

were found in numbers feeding on the leaves of the Joe Pye Weed, *Eupatorium purpureum*, L., and in some pasture fields the Hard Hack, *Spiræa tomentosa*, L., was seen to be badly infested by a cecidomyid. Many of these plants were entirely covered by these galls. Since, the small fly has been reared and specimens have been determined by Dr. E. P. Felt, as *Rhabdophaga salicifolia*, a species which has been found abundant in Massachusettes and New York on the above plant and also on the Common Meadow-sweet, *Spiræa salicifolia*, L. A single worn specimen of the rare butterfly, *Argynnis triclaris*, Hbn., was taken in the Mer Bleue by Mr. Young. On June 9th three fine examples of this insect were captured in the bog, one by Mr. Criddle, one by Mr. Young, and the other by the writer. Dr. Fletcher has, once or twice previously, collected this butterfly at the Mer Bleue, which is probably the most southern locality known for this insect.

The Fall Webworm, *Hyphantria textor*, Harr., was particularly abundant all over the district. Their conspicuous nests were present in large numbers on willow, maple, elm, birch, apple, hawthorn and wild cherry. On July 25th the caterpillars were about half an inch in length and a little over a week later they were nearly an inch long. It is a pity, and a disgrace to every one who has trees, that this insect is allowed to increase to such an extent and render trees so unsightly by the conspicuous nests made by the larvæ. It is a simple matter for hundreds of owners of trees to cut off these nests when they are first noticed, and trample upon the caterpillars under foot.

The Snow-white Eugonia, *Ennomos subsignarius*, Hbn. On the evening of July 23rd last, enormous numbers of these moths appeared in all parts of the city, being attracted to the electric lights. An account of this visitation is given in the *Ottawa Naturalist*, September, 1908. The large numbers of these insects present on that evening caused a good deal of comment. Some of the electric light poles and the sides of buildings were literally covered with the moths and looked as if they had been whitewashed, or given a coat of white paint. The sparrows of the city had a great feast early the following day. Next morning the wings of the insects were to be seen all along the main streets. At the entrance to some of the larger buildings, the wings were so numerous that some little time had actually to be taken to sweep them away. In Dr. E. P. Felt's valuable report for 1907, which has just come to hand, it is stated that the caterpillars of this moth were found in immense numbers defoliating beech trees in Ulster County, New York, during the summer of that year. Possibly they were present in large numbers in other districts. These caterpillars when seen, were mostly mature, and were pupating by July 26th. Moths from these larvæ emerged soon afterwards and eggs were deposited. The insect, therefore, has been steadily increasing for the last two or three years. No caterpillars have been seen in the Ottawa district during the present season, and it would be most interesting to know where all the moths came from. Their sudden great abundance was certainly remarkable. According to the meteorological observations taken at the Central Experimental Farm, by Mr. W. T. Ellis, there were no strong winds at Ottawa during the week beginning July 19th, nor in fact during the week previous to that. The prevailing winds from July 19th to July 25th were south and southwest, but the word "calm" in Mr. Ellis' report signifies that there was practically no wind blowing when the records were taken. During the whole week above mentioned the number of miles recorded is only slightly over 191, while the average of wind for a week is over 900. Of course, the upper currents may have been very much stronger.

The occurrence of the Apple Leaf Hopper, *Empoasca mali*, LeB., in such enormous numbers was undoubtedly the most notable outbreak of the year in Eastern Ontario. At Ottawa injury was done chiefly to potatoes, although beans and other vegetables were severally attacked. The presence of the insects in destructive numbers was noticed towards the end of June, and the injury continued throughout the summer. These insects, which are pale green in colour, slender, about an eighth of an inch in length when mature, feed on the under sides of the leaves by sucking the juices out of the plants. When they are young and before they have developed wings, they can be destroyed by spraying the infested crop with whale oil soap, one pound in five gallons of water, or with the ordinary kerosene emulsion. Some potatoes which were sprayed early in July, before the young leaf hoppers acquired their wings, were freed from the pest, and were not since injured to any appreciable extent. The severity of this outbreak has been much aggravated this season by the exceptional drought and heat, which weakened the plants, and made them more than usually susceptible to injury by the insects.

The Potato Flea-beetle, *Epitrix cucumeris*, Harr., was present in potato fields in the district in considerable numbers. On August 21st it was found to be abundant on potatoes on the Experimental Farm, working with the Apple Leaf Hopper, *Empoasca mali*. This flea-beetle is sometimes, in hot dry seasons, one of the worst enemies of the potato. Dr. Fletcher recommends spraying the vines with Bordeaux mixture, as this treatment has given far better results than spraying with Paris green.

In early August the Destructive Pea Aphis, *Nectarophora pisi*, Kalt., did severe injury to sweet peas in gardens. The plant lice were present in large numbers and from specimens collected later, a number of parasites of the genus *Praon* were reared. The parasitized plant lice were rather numerous on the vines. Field peas near Ottawa were also much attacked by this pest, several complaints of very serious injury being received at the Division.

Other kinds of plant lice were much in evidence during the season. Apple trees were badly infested by the Apple Aphis. Some young trees examined on August 12th were practically covered with the aphides. Some seedlings were sprayed on August 8th with whale oil soap, 1 lb. to 4 gallons of water, and with the ordinary kerosene emulsion, but neither of these mixtures killed all of the insects. The kerosene emulsion did the better work. Vegetable marrows were much reduced in vitality by the attacks of an aphis. Towards the end of the season, Swede turnips, cabbages, and cauliflowers, were attacked by the Turnip and Cabbage Aphis. Early in October, celery plants were severely injured by plant lice, and many rendered useless. The Woolly Aphis of the Apple and the Woolly Aphis of the Alder were also more than usually abundant.

Cutworms, as usual, did much harm in some gardens early in the season. At East Templeton, near Ottawa, they destroyed many tobacco plants. Mr. Letourneau, of our office, who visited the locality early in August, reported to me that cutworms had been much complained of by the farmers of the district. A rather interesting occurrence of the Variegated Cutworm, *Peridroma saucia*, Hbn., was discovered in one of the greenhouses at the Central Experimental Farm, on August 24th. On September 1st, larvæ about ½ an inch long were brought into the Division. In all about 75 larvæ were collected, which had been found feeding on Primulas. No other plants were injured. In confinement they grew rapidly and buried on September 12th, 13th and 14th, the moths emerging in the office on October 20th and 22nd. (Fig. 31).

The caterpillars of the Small White Cabbage Butterfly, *Pontia rapæ*, L., were very troublesome in the Ottawa district during the past season, and many market gardeners complained of their ravages. The remedy of dusting the plants with pyrethrum insect powder, 1 lb. in 4 lbs, of cheap flour, after the whole has been mixed together and kept in a tight jar for 24 hours, is so simple that it is most remarkable that the annual loss by this insect is allowed to take place.

The Codling Moth, *Carpocapsa pomonella*, L., was injuriously present in many orchards in the district. A number of trees near the city were examined on August 12th, and it was estimated that about 25% of the apples on some of the trees were wormy.

The work of the Pear-tree Slug, *Eriocampa cerasi*, Peck., (Fig. 32), which does much harm to pears, cherries and plums, was noticed on plum trees on August 25th. Many of these slimy, greenish-brown, slug-like, larvæ were present on the trees and had done very apparent injury to the foliage. Specimens were found as late as October 5th feeding on the leaves. Spraying with any of the recognized poisonous mixtures, or dusting the trees at short intervals with freshly slaked lime, will destroy the larvæ.

Many householders complained of the ravages of the Clothes Moth. This insect was certainly very abundant in Ottawa during the past summer and did a great deal of damage to furs and woollen goods in houses. The best remedies for these insects are of a preventive nature. All articles liable to attack should be well shaken, brushed, and put away before the moths appear in the spring. As the caterpillars feed only on substances of animal origin, clothing, etc., to be protected may be wrapped tightly in linen, cotton or paper, and left in this way until required for autumn and winter use.

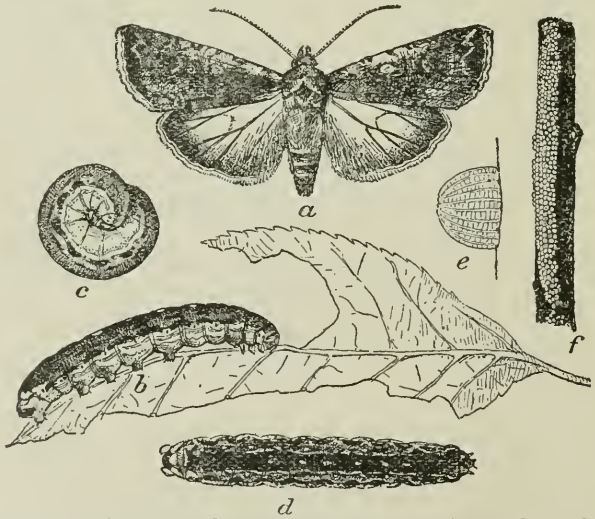

Fig. 31. *Peridroma Saucia; a*, moth; *b*, normal form of larva, lateral view; *c*, same in curved position; *d*, dark form, dorsal view; *e*, egg from side; *f*, egg mass on twig (after Howard, Division of Entomology, U. S. Dept. Agriculture).

Fig 32. Pear-tree slug.

PRESENT CONDITION OF THE WORK CONNECTED WITH THE IMPORTATION OF THE FOREIGN PARASITES OF THE GIPSY MOTH AND THE BROWN-TAIL MOTH.

By L. O. Howard, Washington, D.C.

In sending this paper to be read before the forthcoming meeting of the Entomological Society of Ontario, the writer assumes that the members of the Society, through the reports by Doctor Fletcher and through the reading of reports published by the Bureau of Entomology of the U. S. Department of Agriculture, as well as from the lecture delivered before the Society last year by Mr. A. H. Kirkland, are informed concerning the progress of this work down to the close of 1907, and what follows is supplementary to that information.

In the autumn of that year the parasite laboratory was moved from Saugus, Mass., to Melrose Highlands, Mass. The new location is much more accessible to Boston and to most of the field colonies of the parasites. The buildings, including several substantial structures built for laboratory purposes by the State of Massachusetts, are much beter fitted for the work. Upon the whole the results of the year's importations have been very promising.

In planning the work several new features have been introduced. The parasites that are constantly being sent over by agents belong to three main groups, namely those of the order Hymenoptera, including the Ichneumon flies, the Chalcis flies and others; those of the order Diptera, including the Tachina flies, and those of the order Coleoptera, including the predaceous ground beetles. The amount of material received has been so great, and the character of the different life histories of the insects involved has been so diverse that it has seemed of great importance to have a thoroughly trained expert, skilled in the biology of each group, placed in charge of each group. This has been done, and an expert has had charge of the Hymenoptera, another of the Diptera, and another of the Coleoptera.

Further, the condition of European sendings by mail and by express during the summer of 1907 was by no means uniformly good. The sendings from eastern Europe which are subject to long railway journeys in addition to the sea voyage, frequently arrived in bad condition. Therefore an innovation was made and a general laboratory depot was established at Rennes, France, under the general supervision of Mr. René Oberthür, and a skilled assistant, Mr. A. Vuillet, was placed in specific charge. Nearly all of the European sendings were shipped to Rennes, were examined, repacked, carried personally by Mr. Vuillet to Cherbourg or to Havre on the known days of sailing of certain steamers, then placed in the hands of the chief stewards of the vessels and carried in the cold room to New York where they were admitted without customs examination and sent direct to Boston. This method has resulted in a much beter average condition of the material received, and has facilitated the rapidity with which the work is being accomplished. The courtesy of the steamship officials is highly appreciated.

The third innovation has been an attempt to secure Japanese parasites of the gipsy moth. It has been known for some years that the true gipsy moth, or one of its varieties, or at least a most closely related species, occurs in Japan, though not in great numbers, and that it is apparently held in check by its parasites. Rev. H. Loomis, an American living in Yokohama, has repeatedly written to the State authorities of Massachusetts and to the

Chief of the Bureau of Entomology conveying this information, and attempts have been made by mail and otherwise to send these parasites to the United States, but without success. Later information received from one of the most skilled economic entomologists of Japan, Mr. Nawa, indicated that there exists in Japan an important egg-parasite of the gipsy moth. Remembering that the Massachusetts gipsy moth came originally from Europe it seemed altogether desirable to introduce first the European parasites, and it seemed probable that these would by themselves reestablish the balance of nature. Then too, the importation of the Japanese species seemed somewhat dangerous, on account of the chance that the Japanese Gipsy moth might prove even more voracious and destructive than the European moth; but, after consideration, it was thought best to leave no stone unturned and to neglect no chances in the search for effective parasites. The European service of collectors and agents and advisers had been well organized and instructed during three annual visits of the Chief of the Bureau to Europe, and it was therefore decided to interrupt the European trip for the present year and to send an agent to Japan. Professor Trevor Kincaid, of the University of Washington at Seattle, was chosen on account of his skill as a collector, his comparative proximity to Japan, and the fact that he is personally acquainted with many persons in Japan. He sailed on the 2nd of March, and the results of the expedition have more than justified the expense involved. A very large amount of parasitic material has been received from him in good condition at Boston, and very many parasites from Japan have been colonized in the woodlands of New England.

Still another decided innovation has been the carrying on of active winter work with parasites, especially those secured from imported nests of the brown-tail moth which began to come in from Europe in December. It was found quite possible to breed these parasites in artificially heated rooms, feeding them upon hibernating native brown-tail moth larvæ brought in in their nests from out of doors, feeding the latter upon lettuce and other hothouse foliage and in the early spring securing more normal food for them by sending it up in boxes by mail from Washington and points south. In this way the breeding of the parasites of the genus Pteromalus was carried forward uninterruptedly throughout the winter, and, as during the breeding of successive generations they multiplied exceedingly, it was possible later in the year to liberate a vastly greater number of individuals than would have been possible had the imported species been allowed to hibernate normally in the nests. In the course of this work Mr. W. F. Fiske, in charge of the breeding operations, has invented a rearing tray which has been of the utmost advantage and which will greatly facilitate parasite rearing work in the future.

Still a fifth innovation and one of great value has been the discovery and practice of retarding the development of brown-tail moth eggs by keeping them in cold storage until the arrival of the European egg-parasites which will oviposit upon and breed in these cold storage eggs as freely as those which they attack in the state of nature. This process it has been ascertained may be carried on for a long time, and successive generations of these egg-parasites may be reared from eggs retarded in their development by cold storage. It is thus easy to breed and to liberate an almost infinitely greater number of these egg-parasites, and under favourable conditions, than would be possible from a simple importation of European parasitized eggs which would have to arrive in America at a specific time. These latter innovations have been due to the ingenuity of Mr. Fiske to whom great praise should be given.

In the same way great advance has been made in the rearing of the Tachinid parasites, under the charge of Mr. C. H. T. Townsend who has devised methods and made observations that have greatly added to our knowledge of the biology of these insects and have resulted in the accumulation of a store of information of the greatest practical value not only in the prosecution of the present undertaking but in any problem of parasitic introduction or control that may arise later. Extraordinary and almost revolutionary discoveries have been made in the life histories of certain of these flies, and without this knowledge the greatest success in handling them practically could not have been reached.

Similarly Mr. A. F. Burgess, in charge of the Coleoptera, has succeeded in a very perfect way in rearing and liberating the important European predatory beetle *Calosoma sycophanta*, as well as some other insects of the same family. Altogether during the fiscal year the following material has been imported:

Brown-tail egg-masses, about 26,000.
Hibernating nests of the brown-tail from 50,000 to 60,000.
Larvæ and pupae of the brown-tail, about 178,000.
Gipsy moth egg-masses, 7 boxes, each containing very many masses.
Gipsy moth larvæ and pupæ, about 161,000.
Gipsy moth larvæ from Japan, 8 large boxes containing several thousand larvæ and parasitic cocoons.
Predatory beetles, 2,892.

It will be noticed that only about half as many of the hibernating nests of the brown-tail were imported during this fiscal year as during last, but the smaller number is offset by the larger numbers of larvæ, pupæ and egg-masses, so that the gross amount received is about the same as that of the previous year. The material received from Japan listed above came in before the 1st July, but in all there have been received about 40 boxes, nearly all of large size. From one shipment of the cocoons between forty-thousand and fifty-thousand adults of one of the most important parasites of the genus Glyptapanteles were reared and were liberated directly in the open.

The colonization work has been going on rapidly during the summer of 1908, and of the species colonized the following have been the most numerous:

Pteromalus from the brown-tail moth nests, 114,000.
Trichogramma from the brown-tail moth eggs, 11,600.
Telenomus from brown-tail eggs, 4,560.
Apanteles of the brown-tail, 12,875.
Japanese Glyptapanteles, 45,000.
Meteorus from brown-tail, 1,080.
Pimpla from brown-tail pupæ, 2,051.
Unclassified Tachinids, 4,177.
Named Tachinids, 1,600.
Calosoma sycophanta, adults and larvæ, 978.

Thus making nearly 200,000 of the most active enemies of the gipsy moth and the brown-tail moth liberated under the most favourable conditions during the year.

The result of the colonization work of previous years has not become very evident. It is altogether likely that the species introduced have found conditions favourable to their increase and that at the present time they exist in considerable numbers. The area, however, is so extensive as to make their occurrence in ordinary collections a matter of chance rather than

of likelihood. There has been during the past two years a tremendous destruction of the larvæ of both brown-tail moth and gipsy moth from bacterial and fungus diseases. These diseases have appeared in spots, but unfortunately some of these localities were those where colonies of parasites had been established, and in the wholesale destruction of the caterpillars by disease the introduced parasites must have suffered severely. Knowledge has been gained, however, which will make it more easy to select better localities for colonization in the future. Several of the parasites have been found to have established themselves, and notably the predatory beetle, *Calosoma sycophanta*, has been found in numbers. At least seven species have been found under conditions which indicate their establishment.

There have been imported in all 23 species of Hymenopterous parasites, of which 16 are European. 6 are from Japan, and one at least is common to both regions. Eleven of these have been reared from the gipsy moth, six from the brown-tail moth, and six from both insects.

A number of species of secondary parasites have been reared, and have been killed.

Of Dipterous parasites, at least 29 distinct species have been imported, of which nearly all are parasitic upon both gipsy moth and brown-tail moth.

Of Coleoptera, five species have been imported, all of which will feed upon both gipsy moth and brown-tail moth.

This makes a total of 57 beneficial species, enemies of gipsy moth or brown-tail moth or both, that have been brought over in the course of this work.

The outlook is more favourable than at any period during the progress of the work. Success seems an ultimate certainty, but the time at which perfectly obvious results will be apparent is as yet uncertain.

THE STRAWBERRY WEEVIL (*Anthonomus signatus*).

By William Lochhead, Macdonald College, Que.

This insect is reported as having done considerable damage in 1908 in certain localities, particularly Prince Edward County. It is a small brownish weevil about 1-10 inch in length, with a snout about half as long as the body. The specific name *signatus* is given it on account of the dark spot near the middle of each wing cover.

There is probably but one brood a year. The weevils make their appearance about the time of the earliest blooming of the staminate varieties, and continue their depredations for three or four weeks. "The female first deposits an egg in the bud, then punctures or cuts the stem below it so that in a few days it drops to the ground. Within the severed bud the larva hatched from this egg develops and transforms to the pupa and afterwards to the beetle" (Chittenden, Circular 21, U.S. Bureau of Entomology). The larva hatches from the egg in from 4 to 7 days, and feeds on the pollen within the buds. It becomes full grown in less than a month, and transforms to pupa, and to adult within the cavity of the bud. The pupal stage lasts about a week, and the entire cycle lasts about five weeks.

The adult weevil soon makes its way out of the bud, feeds for a few days; then finds a suitable hiding place for the remainder of the year.

Remedial Treatment: (1) As the weevils are always found on flowers that bear pollen, it is advisable in districts where the weevils are injurious

to grow mostly pistillate varieties, and only enough of staminate plants to pollinate the pistillate plants.

(2) Chittenden says that covering the bed is nearly a perfect preventive. This covering may be of muslin, and should be in position at least a week before the first blossoming occurs, and left in position until the first berries are picked.

(3) Another remedy is to grow profuse blooming varieties.

(4) Trap crops of very early blooming varieties such as the "Chas. Downing" may be planted. Upon these the weevils collect, and many can be killed by the application of arsenical sprays.

(5) Clean culture may be of considerable value in controlling the weevils —the removal of volunteer plants, and the burning over in early spring of underbrush and weeds.

(6) Certain substances, such as dilute crude carbolic acid (1 part in 100 of water), and Bordeaux, seem to act as repellents, and their application would appear to be of value.

WHAT ENTOMOLOGY THE FARMER AND FRUIT-GROWER SHOULD KNOW.

By William Lochhead, Macdonald College, Que.

This title was suggested to me after reading an address on this topic by Dr. S. A. Forbes, State Entomologist of Illinois. I must also confess to the appropriation of many of the ideas in Dr. Forbes' address, for they represent the matured thought of a distinguished Entomologist of long experience, and one who has done much valuable work along economic lines. The ideas, however, are not new; they have been expressed, perhaps partially, time and again at the meetings of this Society, at Farmers' Institute meetings, and at Fruit Growers' Conventions. They require however to be expressed often, and in all kinds of meetings, to effect a lodgment with the people and to be incorporated into the practical work of the orchard and farm. That, then, is my reason for dealing with this subject at this time.

1. *The farmer and fruit grower should know the principal injurious insects that affect the crops of the farm, orchard and garden.*

As intelligent business men they should be able to identify those agencies that make for losses, and to acquaint themselves with the best up-to-date methods of controlling these agencies. The habit of the insects should be studied, in order that the methods of control may be as effective as possible. Haphazard experimenters are out of place just as much in successful farming as in successful manufacturing. For example, he should know when the Codling Moth of the apple makes its appearance to lay eggs, when the young worms attack the apple, in order that he may apply his poison sprays at the best time to kill them. He should know the life-habits of the white grubs which live two years in the ground as grubs, become pupæ and beetles in the fall of the second year; the beetles not emerging until the following May or June to mate and lay eggs. When infested grass land is broken and the adult beetles are prevented from laying their eggs in that field, he must not expect an entire absence of white grubs, for the young white grubs will continue to feed until their food supply is exhausted. "He will not turn pigs into his grass lands late in fall, to clear

them of the grubs, for these bury themselves a foot or two below the surface on the approach of frost."

2. *The farmer and fruit grower should know the injuries done by the principal injurious insects.*

Every crop is attacked at some part at some stage of its existence. For example, the apple tree may be injured in its seedling stage by the leaf-blister-mite on its leaves and the woolly aphis on its roots; the growing tree by borers, plant lice, oyster-shell scale, San Jose scale; and the fruit by the codling worm and the railroad worm. The turnip is attacked by the flea-beetle, during its young stage, and by the turnip aphis and others during its growing period. The corn plant may be injured by the attacks of the seed-corn maggot and wire worm on the seed in the ground, by the white grub and wire worm on its roots, by the cut worm on its stems, by the corn worm on its leaves, and by the grain moths on the stored grain.

The farmer and fruit grower should be able to diagnose the causes of the most serious insect troubles by the nature of the injuries inflicted, as he would diagnose the cause of any ailment of his live stock. It is possible after a careful study of the injuries to plants to identify the particular insects that are causing the injuries, and to deal with them effectively. Sometimes one has to rely entirely on the nature of the injuries for the identification of the insect. Cutworms, for example, work at night and lie concealed in the day time. It is easy to distinguish the work of sucking insects from that of biting insects, but this easy distinction is of prime importance in any rational control of a pest. We sometimes hear of gardeners and fruit-growers using paris green for the control of plant lice. A little elementary knowledge of Entomology on their part would have saved them money, and would have given them success instead of failure.

3. *The farmer and fruit grower should know the characters of the chief orders of insects*, and should be able to recognize the order to which any common injurious form belongs from a glance at the *larva* or *adult*. There are for all practical purposes but seven orders or divisions into which the chief injurious insects may be placed. He should know what orders or groups pass through a *complete* metamorphosis,—from egg to larva, to pupa, to adult,—during their life-history, and what orders have an *incomplete* metamorphosis, *i.e.*, have the young somewhat like the adults; the meaning of the terms *cocoon*, *chrysalis*, *larva*, *pupa*; the difference between a *caterpillar* and a *grub;* between a *grub* and a *maggot;* and of what order each is characteristic; what orders have biting mouth parts, and what orders have sucking mouth parts. All this information is needful and preliminary to an intelligent control of injurious insects.

4. *Every Farmer and Fruit Grower should know the Effect of Crop Rotations, Good Cultivation, etc., i.e., Cultural Methods in Insect Life.*

Cultural methods stand opposed here to *artificial* methods, such as spraying. Where crop rotation is not practised the white grub and wire worms sooner or later take possession of grass lands, and the cultivated lands for a year or two after they are broken. But a good crop rotation, where the crop is changed frequently makes it impossible for any insect to pass through its life-stages without being seriously disturbed and its food supply destroyed. Some rotations are preferable to others when certain

insects become injurious. For example, where corn is the chief crop, a rotation of *clover, corn, oats* is better than *forage grasses, corn, oats*, for the reason that many insects which are injurious to hay and grass land are also injurious to corn.

Where a system of short crop rotations has been in use injurious insects such as the wire worm and white grub are seldom troublesome. The setting apart of a field for a number of years in succession to the same crop, be it pasture, hay, oats, wheat, clover or corn, must of necessity be attended with serious loss from insect injury.

Good cultivation involves careful treatment of the soil, the crop, and its products. It means careful attention to the waste products and the waste places which are breeding places for many insects injurious to farm crops. It means the adoption of deep late fall plowing under certain conditions, which practice is one of the best methods of dealing with wire worms, white grubs, cut worms and grass-hoppers. It means high fertility of soil, and good drainage of the land, so that vigorous, healthy plants, capable of resisting the drains of insect attacks are grown instead of poorly nourished ones, which are much more liable to succumb.

The effect of high culture is to make the plants recover quickly from insect attacks. Dr. Forbes says correctly, "The effect of nearly every form of insect injury is virtually a *starvation* effect. If the roots of a plant are eaten away or otherwise injured, the surface for the absorption of food is thus reduced and the plant suffers from starvation as a consequence. If the elaborated sap is withdrawn from its cells and vessels by the beaks of sucking insects, the effect is essentially the same—the plant is starved. If the substance of the leaf is injured or destroyed the process of assimilation is interfered with, and less assimilated food becomes available for maintenance and growth,—again a starvation effect."

The effect of timely plowing and planting in the control of insects is not well enough known by our farmers. Much valuable information on these points is now available. Two or three late fall plowings are efficacious against wire worms and white grubs; early plowing of grass land in August will prevent severe cutworm attacks the following year; late sowing of fall wheat will prevent Hessian Fly injury; and early cutting of the first crop of clover will destroy the first brood of the clover-seed midge, and thus save the clover-seed of the later crop.

5. *Every Farmer and Fruit Grower should know the value of Co-operative measures in dealing with injurious pests.*

The importance of co-operation has been brought vividly to our attention in several cases; *viz.*, the Hessian Fly outbreak a few years ago, the Pea-weevil scourge, the Codling Moth and the San Jose Scale ravages; and the apple maggot injuries in some sections. As a matter of fact, many of our economic problems in Entomology will remain unsolved until a widespread public co-operative sentiment arises in our midst, "Many difficulties which would yield at once to community action are beyond the power of individual remedy."

I have stated briefly five of the main points which I believe every Farmer and Fruit Grower should know. While we realize that but few persons possess this knowledge, are we doing much to hasten the day when all shall have this knowledge? I believe this Society has done much good through its individual members and through the Reports which are published every year. I believe, however, that the most effective work must be done

at the agricultural colleges with the young men who assemble there for instruction. Such knowledge as I have indicated cannot be imparted in a few popular lectures. Time is required to give the knowledge of, and and acquaintance with the insects that will be of much practical value to the young farmers when they return to put into actual operation the lessons they have learned in the class-room and laboratory.

I believe the agricultural colleges are giving courses in Entomology along the very lines I have indicated. The courses in Entomology at the O. A. C. and Macdonald College are so arranged that the important elementary economic topics are discussed and studied in the second year by all the students in that year. Practically, then, all students who attend the O. A. C. and Macdonald College are given instruction in this most important aspect of agricultural operation. Unfortunately all students are not missionaries; many fail to proclaim the important entomological tidings to their benighted neighbours, and so the great work of the evangelization of the whole land is delayed. The wide-spread interest in agricultural education for rural schools indicates that some of the seed, at least, that was planted by the older men among us fell on good ground; for the present, interest has, to some extent, developed by way of *Nature Study*.

To one who took an active part in this movement for agricultural education it is clear that the presentation of the various phases of insect life by many of the members of this Society throughout the Province made a deep impression, whereby it was possible to introduce Nature Study into many of our schools.

INJURIOUS INSECTS IN ONTARIO IN 1908.

By C. J. S. Bethune, Ontario Agricultural College, Guelph.

The season of insect activity, which has now come to a close, has not been marked by any unusual outbreak, such as that of the Variegated Cutworm last year, but several of our well known pests have been more than usually destructive to certain kinds of vegetation. The long hot summer, with plenty of rain in this part of the Province till the middle of August, and the subsequent protracted drouth which has lasted with but few slight breaks till the present time (November), has been favourable to the multiplication of many insects while detrimental to others.

Insects Affecting Farm Crops.

Plant-Lice. There have been more complaints this summer concerning the damage done to turnips and cabbages by Plant-lice (Aphids) Fig. 33, than regarding any other kind of insect. From every part of the Province letters have come asking what could be done to get rid of the pest and to save the crop. Usually the application has been too late—the plants have been injured beyond recovery, and no treatment could restore their lost vitality. The warm dry weather in September was very favourable to the increase of this most prolific insect, and they multiplied to enormous numbers before their attack was noticed. They usually congregate on the under side of the leaves and are out of sight to a casual observer, but many of them are on the upper surface as well and the dead and withering leaves should serve to draw attention to them. These plant-lice are dark green in colour. much the same shade as the leaf they are feeding upon, and are

covered with a mealy-looking powder of a bluish or ashen hue, which gives them a particularly disgusting appearance. Each of the myriad lice is engaged all day long in sucking the juices of the plant on which it is stationed and the combined effect of so many feeders is soon shewn by the impoverishment and destruction of the leaf.

These sucking insects can be destroyed by the application of any of the usual contact remedies, such as kerosene emulsion, tobacco wash or strong soap-suds; the last is probably the cheapest and easiest remedy to procure and has been found very effective. A difficulty, however, is experienced with all these applications in getting at the insects on the under side of the leaves which are often close to the ground. In order to ward off an attack next year all the refuse of the crop, such as cabbage stalks and turnip leaves, should be destroyed by forming them into a compost heap or some other method which will prevent any lice upon them from finding secure winter quarters, and also kill the eggs which are laid on stems and leaves. This should have been done as soon as the crop was taken off the field. Next year these vegetables should not be planted on the same piece of ground, and should be watched for the first appearance of any colonies of lice. If a sharp look-out is kept during hoeing and any affected plants cut out and crushed under foot, a very great deal will be done to reduce the number of colonies if not to entirely clear out the insect.

Wire-Worms and White Grubs. (Figs. 34 and 35). Next in order to the foregoing were enquiries respecting these two classes of insects, which attack the roots of various plants and destroy large numbers of them. Being underground feeders no method has yet been found of applying a poison for their destruction. A great many experiments have been made in various places and all sorts of things have been tried, but nothing has yet been found to answer the purpose. Salt is often suggested, but it would require so large a quantity to kill the worms that all vegetation would be destroyed as well. Apparently the only thing that can be done is to prevent their breeding and coming to maturity by a short rotation of crops. Both these insects increase and multiply in grass lands, especially old pastures, where the worms and grubs feed upon the roots. If left long undisturbed they become very numerous and destructive. When an infected field of this kind is broken up for the first time, not much damage is done to the crop that is put in as the worms have still plenty of food in the roots and leaves of the grass that has been ploughed under. The next year this supply of food is gone and the worms must attack the roots of the crop whatever it may be or perish of hunger. Hence it is that corn and many other things suffer severely the second season after the grass field has been broken up. The most effective method, so far as the writer knows, is to plough up the infested field in August to destroy the tender pupæ which have been formed by that time and again late in October to expose the newly formed beetles and also the young worms to the cold and frost of winter; this ploughing will also enable birds and other creatures to get at and devour them; poultry and pigs will feed upon them eagerly and should be allowed to range over the field immediately after it is broken up.

Wheat Insects. The Hessian Fly has been present in injurious numbers affecting winter wheat in the Counties of Norfolk, Brant and Essex and in the Niagara District; in other parts of the Province it does not seem to have inflicted any appreciable injury. The plan of sowing wheat after the middle of September in order that the plants may be too late for the egg-laying of the flies has proved satisfactory, though it is attended with the risk in an unfavourable season of having an imperfectly grown plant to

withstand the dangers of winter. A useful method is to sow a strip of wheat two or three weeks before the regular crop and thus provide the flies with a suitable place in which to deposit their eggs; later on this should be ploughed under and the insects destroyed, thus leaving the main crop free from injury.

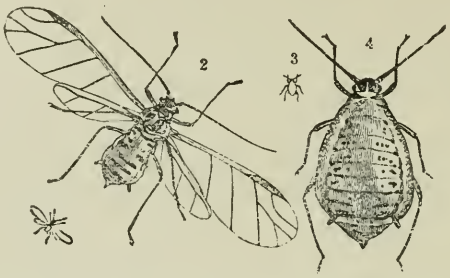

Fig. 33. Cabbage aphis : winged male, wingless female. Small figures are the natural size.

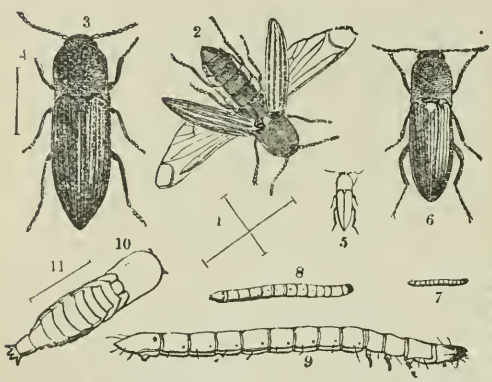

Fig. 34. Wire-worms : beetles and grubs.

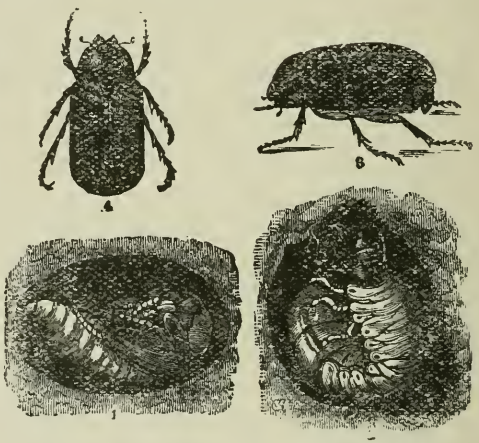

Fig. 35. White grubs ; beetles, larva and pupa.

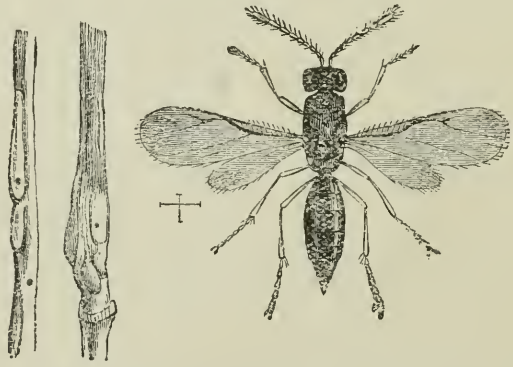

Fig. 36. Wheat joint-worm ; affected joints ; fly greatly magnified.

The Wheat Joint-worm (*Isosoma tritici*, Fitch), Fig. 36, is not of common occurrence in Ontario. Three years ago Dr. Fletcher reported a somewhat severe outbreak at Millbrook and complaints were made of it in some of the south-western counties. This year specimens of its work have been

sent to us from Petrolia only. The parent insect is a minute black four-winged fly, belonging to the same order as Wasps and Ichneumons and to a family most of the members of which are parasitic upon other insects. The eggs are laid at or near a joint of the growing wheat plant, and the larva burrows into the stem and causes a gall-like swelling to be produced inside which it lives and feeds. This swelling becomes hard and renders the straw so brittle above and below it that it is frequently broken off in a storm. The hardened portions which remain when the grain is cut are apt to be separated from the straw and to come through the threshing machine with the grain. When winnowed out these fragments with other refuse should be burnt. Most of the galls, however, are left in the stubble and contain the wintering larvæ; in order to destroy these the field should be burnt over in the fall if practicable, or the stubble deeply ploughed under. Usually a short rotation of crops with clean cultivation serves to keep this insect in check, and thus we do not often hear of any damage being done by it.

Indian Corn Insects. The Greasy Cutworm (*Agrotis ypsilon*) Fig. 37, has severely attacked some fields of corn, cutting off the young plant at the surface of the ground, and also attacking the roots; and the Glassy Cutworm (*Hadena devastatrix*) Fig. 38, caused much damage to several acres of corn near Listowel. Other species have seriously injured turnips and wheat in some localities. These night-feeding caterpillars are half grown in autumn and feed voraciously on almost any kind of vegetation that comes to hand in the spring. Fortunately there is a very satisfactory remedy which can easily be applied; it is called the poisoned Bran-mash. It is made by mixing half a pound of Paris green in fifty pounds of bran, stirring constantly and adding the poison little by little; this is sweetened by the addition of two quarts of cheap molasses previously diluted in about a gallon of warm water; the whole must be thoroughly mixed to such an extent that the bran will crumble through the fingers and not form hard lumps. The mash is distributed through the infested plot by means of a Planet Junior drill or by hand in the evening, taking care that poultry do not get at it. The worms come out at night and devour it in preference to the plants, and usually go off to die either under the surface of the ground or some other convenient hiding place, so that no dead ones are found lying about in the morning. One who tried this remedy with very much doubt as to its value, unearthed quarts of dead cutworms after a night's application and became thoroughly convinced of its effectiveness.

The Pea Moth. (*Semasia nigricana*) Fig. 39, has been troublesome in the neighbourhood of Lindsay. Eggs are laid by the parent moth on the young pods and from these hatch out small caterpillars which make their way inside and devour the peas; when full grown they leave the pods and form a cocoon beneath the surface of the ground and there remain all winter, the moth coming out the following summer. It has been found that early maturing varieties of peas are free from the attack as they are too far advanced when the eggs are laid, it is therefore advisable to sow as early as possible wherever it is known that there is danger of injury from this insect. In gardens the ground should be dug deeply in the fall to bury the cocoons so that the moths cannot reach the surface when they come out, and all immature pods should be burnt when the crop has been picked. In

field cultivation deep plowing and the removal of all refuse should be attended to; any infested plot should not be sown with peas again for two or three years. It is not likely that any poison can be successfully applied as the worm buries itself in the pod as soon as it is hatched.

The Pea Weevil. (*Bruchus pisorum*) Fig. 40, is to be found every year in many localities. If growers everywhere adopt the simple method of fumigating with bisulphide of carbon as soon as possible after harvesting there would soon be little injury to complain of; one ounce to one hundred pounds of seed has been found sufficient. All refuse after threshing should be cleaned up and burnt and no weevilly peas should ever be sown.

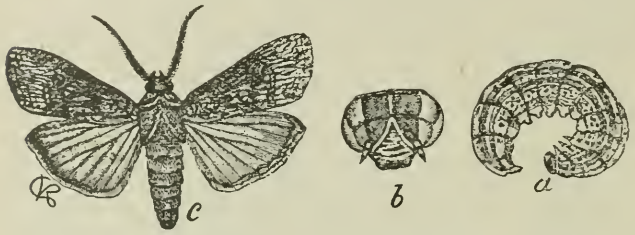

Fig. 37. Greasy Cutworm; (*b*) front of head; (*c*) moth.

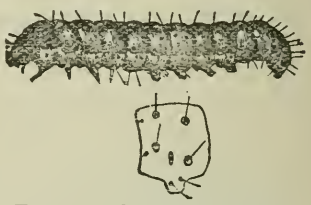

Fig. 38. Glassy Cutworm.

Fig 39. Pea moth, larva and infested peas.

Fig. 40. Pea Weevil.

Clover-Seed Midge. Many complaints have been received respecting loss caused by this insect. The adult is a two-winged fly which lays its eggs in the flower heads of clover; the maggots, when hatched, burrow into the ovaries and feed upon the developing seeds. They become mature at the end of June, descend into the ground and pupate there. A second brood of flies come out when the clover is again in flower and the same course is repeated; in this way both crops are prevented from maturing a large proportion of their seed. The winter is passed by the maggots in

the earth; they do not, like the Pea-weevils, remain in the seed or continue their work of destruction. These red larvæ may, however, be found amongst the seed after threshing, but any that we have seen at that time were dead.

There is a simple remedy which has been found very effective, that is to cut, or feed off, the first crop of clover by the 15th of June, and thus destroy the maggots before they go into the ground to pupate. The result is that they fail to mature and there are no flies to lay eggs for another brood. The second crop will then produce good clean seed, having the further advantage of many more bumble bees in August than there were in June to assist in the process of fertilizing the bloom.

Insects Affecting Fruit-Trees.

In the earlier part of this report there is given an account of the discussion of many of the most serious insect pests of the orchard; it is, therefore, unnecessary to refer to them here, except very briefly. Of the scale insects we have as usual received complaints of the Oyster-shell Bark-louse from all over the province. The San José scale is reported from Dresden, a new locality; the Curtis and Scurfy scales have been sent in from Simcoe and from Vineland, and no doubt are to be found in many other places, but they are seldom numerous enough to do any serious damage.

The Pear and Cherry-Tree Slug (*Eriocampa cerasi*) has been very abundant in many places this year; the second brood continuing their injury to the foliage till quite late in the fall. The slimy black or greenish slug-like larvæ can be destroyed by dusting with Paris green or lime, or spraying with white hellebore mixed in water.

Apple-trees in unsprayed orchards in Sandwich, London, Simcoe, Guelph and other places suffered a good deal from the Cigar Case-bearer, the Apple-bud Moth and the Trumpet Leaf-miner. The fruit itself was attacked in many localities apparently by the Snowy Tree-cricket and the Plum Curculio, causing malformations of the apples and a serious impairment of their value; the Tussock Worms were also found attacking the fruit in a similar manner. Not much attention has been paid to injury from these sources; it is important therefore that careful observations should be made both as to the insect causing the injury and the time when it is done, in order that intelligent measures may be adopted for prevention.

Among the small fruits, Strawberry plants have been much damaged by Wire-worms and White-grubs at the roots, especially where they were planted in old pasture fields which had recently been broken up. It is impossible to apply any remedy for the destruction of these underground feeders; the only method of getting rid of them is by a short rotation of crops involving frequent cultivation of the soil and the consequent disturbance of the grubs and pupæ, as stated in the earlier part of this paper. The Strawberry Weevil has caused some damage by cutting off the pollen-bearing blossoms and preventing the setting of the fruit.

The Rose Chafer, which usually appears in swarms about the time that the Grapes are in blossom, has not been so abundant as usual this year, though bad at Cooksville, Niagara Falls, Simcoe and some other places.

Raspberry and Blackberry bushes have been attacked in some localities by the Cane-girdler—a slender beetle, less than half an inch in length, black in colour with an orange or yellow thorax on which are three black dots. The beetle bites a series of small holes close together all round a cane not very far from the tip, and then makes another series about the length of its own body from the first; between these two girdlings it excavates a hole and deposits an orange coloured egg. The grub lives on

the pith of the cane, which soon withers and dies above the girdling, and is checked in its growth. All affected canes should be cut off an inch or two below the place attacked and the prunings burnt in order to destroy the grubs within them.

A Leaf-miner (*Scholioneura capitalis*) has been very prevalent this year at St. Catharines, Oakville and in Prince Edward County, injuring the leaves of Blackberry bushes; in some cases a large proportion of the leaves were attacked and became prematurely withered.

Insects of the Vegetable and Flower Garden.

There has been no special outbreak during the past season, but many of our familiar pests have been more or less abundant and destructive. The Asparagus beetles, which came to us across the Niagara river and spread westerly and northerly, are now travelling eastward along the shore of Lake Ontario as well; the latest reports have come from Oshawa. Wherever they go they establish permanent colonies and will require to be dealt with every year.

Plant-lice (*Aphids*), as already mentioned, have been unusually abundant this year, and have not only attacked turnips and cabbage, but also lettuce, peas, potatoes, roses, and most other garden plants, a variety of species being present.

Tomatoes have in several places been attacked by the large caterpillars of the Sphinx moth; where these voracious feeders are numerous they devour a large amount of foliage and sometimes strip the plants of their leaves. Being so large and conspicuous they can easily be picked off by hand and crushed under foot. Owing probably to the very hot weather in September a number of moths emerged from the chrysalids that we had in a breeding cage, instead of remaining buried in the ground all winter.

Miscellaneous.

The Mediterranean Flour Moth (*Ephestia Kuhniella*) has made its unwelcome appearance in several mills in this part of Ontario. In one situated in Guelph, an annual fumigation with hydrocyanic acid gas is made with excellent results; it would probably be better, however, to repeat the operation at an interval of a few weeks when another brood may be developed, as it is doubtful whether the gas will kill the eggs of the insect. All sacks and packing material brought from other places should be steamed, or otherwise treated, as the insect is evidently in this way introduced into mills previously free from it.

The Indian-meal Moth (*Plodia interpunctella*) has been found in numbers infesting a mill, and the caterpillars in another place were discovered devouring seed wheat, of which they eat the germs and thus spoil a larger quantity than they actually consume. If a whole building should be infested by them it would be advisable to fumigate with hydrocyanic acid gas, but where they are confined to the grain bins they may be destroyed with bisulphide of carbon.

Grain Weevils (*Calandra granaria* and *oryzæ*) have also been found infesting stored grain. These small snout beetles will continue for years breeding and devouring the grain in the same receptacle if left undisturbed. Bisulphide of carbon may also be used as a remedy for these as well as any other granary insect. One great means of preventing injury from all these insects is cleanliness; all bins and other places where grain is stored should be thoroughly cleaned out at least once a year, and fresh grain should not

be brought in till the old has been cleared out. All corners and dark places where flour-dust and other refuse accumulate should be regularly swept out at short intervals and thus leave no undisturbed breeding places for these destructive creatures.

Another insect troublesome in the barn is the Clover-hay Worm (*Asopia costalis*), the caterpillar of a very pretty little moth, which has rich red wings adorned with yellow markings. The caterpillar feeds upon dry clover, both in the stack and the mow, and spoils it for fodder, as cattle will not eat it when badly infested. In this case also cleanliness is most important; no old clover or refuse should be left in the barn when fresh supplies are about to be brought in, and the remains of old clover stacks should be burnt or thoroughly cleaned up before a fresh one is built on the same spot.

During a summer trip to Fort William and Port Arthur it was disheartening to find that the Larch Saw-fly (*Nematus Erichsonii*) had extended its ravages along the north shore of Lake Superior. On the line of railway as far east as Nepigon the tamaracs were noticed to be every where dead or dying; on reaching this latter place an examination was made of a number of trees and all were found to be swarming with the caterpillars of this insect. This region of country was burnt over some twenty-five years ago, and the land is now covered with a vigorous growth of young trees of various kinds twenty and thirty feet in height. Scattered through these, as well as in clumps, are great numbers of larches, all of which seemed to be infested with these worms; in all probability in a year or two there will not be a living one left, thus repeating the devastation that was experienced some years ago in the Eastern Townships of the Province of Quebec. As the insect abounds over hundreds of miles of wild country it is evident that nothing can be done to check its devastating work.

Spruce trees in this part of Ontario continue to be attacked by the Spruce Gall-louse (*Chermes abietis*), which has several times been described in these reports. Young nursery trees and individuals grown for ornament may be treated when the young lice are exposed towards the end of May and of August with a soap and tobacco wash or kerosene emulsion. At Whitby some Spruce trees were defoliated this year by the caterpillars of the Spruce Saw-fly (*Lophyrus abietis*). Spraying with any of the arsenicals, applied as soon as any of the worms are seen, would soon get rid of them.

INJURIOUS INSECTS OF QUEBEC IN 1908.

By William Lochhead, Macdonald College, Que.

The damage done by insects in Quebec in 1908 has not been heavy. The season was exceptionally dry over a large area of the Province, which condition may have influenced the insect life in some way not yet ascertained. Dr. Forbes, of Illinois, says that "a wet season—if not too wet—is a favorable one, and a dry season an unfavorable one," inasmuch as the condition tends to the increase in growth and food-supply to the plant. Most serious insect injuries to growing crops diminish with wet weather and increase with dry. In very wet weather "the sap of the plant may become so dilute, through excessive absorption of water by the roots that it loses its nutritive value, and insects dependent on it are not so well nourished as by the denser sap of a plant growing in a drier soil. They consequently grow less thriftily and multiply less abundantly, and may

even diminish rapidly in numbers during a wet season, while if the weather were dry and their food nourishing they would increase steadily at a geometrical ratio. After a year or two or three of drouth the intelligent farmer will be more watchful for the first appearances of insect outbreak than after a series of unusually wet years." The Relation of Weather to Insect Life is still a baffling problem, but the economic importance of a satisfactory solution warrants the spending of much time, money, energy, and ability.

It is just as difficult to get reliable returns concerning insect pests from Quebec as it is from Ontario. Many of our common injurious forms are still known as *worms*, or *bugs*, *vers* or *pucerons*, and there are but few persons who can name even the most common injurious insects.

Insects Affecting Cereal Crops. No reports of the presence of the Hessian Fly or Wheat Midge have been received from any part of Quebec. The wheat grain aphis did considerably damage in certain localities. At Macdonald College the experimental plots were badly infested, but towards the end of the season it became very evident that the parasites were very numerous, and that they were controlling the aphis, but they did not appear soon enough to prevent serious damage.

Insects Affecting Vegetables. The cabbage and turnip aphis was a very common pest in late summer and autumn, but judging from reports which have reached me, no very serious damage has resulted. Mr. Chapais informs me that he has not found the *Cabbage aphis* in eastern Quebec. The *green cabbage worm* has been prevalent over a large part of Quebec, and considerable damage has been done. It is a very common pest in eastern Quebec, but not plentiful. The *Cabbage Root Maggot* can usually be found in most fields of vegetables where cabbage and rape are grown, but for the last two or three years, this pest has not made itself manifest to any extent. In some parts of the Province this insect is unknown, as it occurs only at intervals of many years. The *Squash Bug* (Anasa tristis) is not met with in Quebec. Mr. Chapais reports meeting with it now and again, but he says it never causes much damage. I have not seen any specimens of it at Macdonald College during the last two or three years. The cucumber beetles, however, are very abundant and injurious. In eastern Quebec they are not so abundant as in the western parts. The melon aphis, although present, is not at all injurious, and has not been found by Mr. Chapais east of Quebec. The Colorado potato beetle is keeping up its reputation as being the most abundant and persistent pest we have. In spite of all changes in temperature—hard winters and mild winters, wet summers and dry summers, this pest continues to hold its own. In fact, it seemed as if it required a stronger dose of Paris green to kill it than it did a few years ago.

Insects Affecting Large Fruits. The Codling Moth is reported as being very abundant at Cowansville and at Chateauguay, Covey Hill, Abbotsford, La Trappe and the lower St. Lawrence; in fact, all the reports received emphasize the abundance of this pest of the apple as doing a great deal of damage. The Apple Maggot was not observed at La Trappe, but was very abundant at Como, just across the Ottawa River, and according to Mr. Reid of Chateauguay, is prevalent at Covey Hill. It is evident that it is not prevalent throughout Quebec, else its presence would have been reported by more of my correspondents. The Plum Curculio, which injures both the apple and the plum was a very bad pest at Chateauguay. Mr. Reid states that it is the worst pest the fruit growers have in his district. Mr. Chapais reports it as abundant along the lower St. Lawrence. It does not seem to affect the apples much at La Trappe, but it is very severe on the plums. The green apple aphis is more or less prevalent in

some parts of Quebec, but is not troublesome at Cowansville or in the eastern part of the province. It is very abundant at Chateauguay and La Trappe. The Oyster-shell Bark-louse is also one of our most widespread insects in Quebec, and is reported as being very abundant at Cowansville, but at present it is not injurious at La Trappe to any extent. The Canker-worm is not troublesome. The Fall web-worm is very prevalent throughout the province this present autumn.

Insects Affecting Small Fruits. The Currant-worm is common everywhere, and is very injurious when left uncontrolled. At the Agricultural Institute, at La Trappe, the insect was successfully controlled by Nico Soap. The Raspberry Cane-borer was reported as doing little or no harm, but has been observed as being abundant on the wild canes.

Mites on Raspberries. In 1907 the raspberry plantation at Macdonald College was badly infested and injured by mites, which have the habit of clustering on the under surface of the leaves. They were again observed in June, 1908, and spraying operations were begun to determine the effect of various solutions in controlling the pests. These operations were in charge of Mr. J. M. Swaine. Ten plants were selected of about the same degree of infestation. The following substances were used:

Nico-soap	Fair results.
Lime-sulphur (5 oz. lime, 21-23 S, 2) ½ gal H_2O	Effective but killed leaves.
Lead Arsenate (1 to 10)	Not effective.
Bordeaux	Not effective.
V2 (1-10)	Effective.
Whale Oil Soap, 3 oz., 10 gals.	Fair results.
Tobacco decoction	Fair results.
Kerosene Emulsion (1 to 9)	Most effective.
Water	Effective.

Later, the whole patch, excepting three rows, was sprayed with whale oil soap, tobacco decoction and V2. They all killed the mites, where they were very carefully applied, but on the whole about half of the mites were killed. Tobacco was as effective as any of the substances tried. Probably these mites can be better controlled by winter sprays, and experiments will be conducted this coming winter to test the effectiveness of winter sprays.

The White Marked Tussock Moth. Mr. Swaine reports that the Tussock Moth was not nearly so abundant on the shade trees of Montreal as it was in 1907. Fully 90 per cent. of the larvæ that were collected at random from trees were found infested with parasites. Mr. Swaine bred 16 species of parasites.

Insects of the Eastern Townships. According to Mr. Douglas Weir *Grass-hoppers* were the cause of some damage to the grain crops in the Eastern Townships, and the *Potato Flea Beetle* was observed in somewhat greater numbers than usual, assisting the Colorado Beetle in the devastation of the potato crop.

In the orchards the *Tent Caterpillar* and plant lice were perhaps most evident, while in the forests and wood lots a species of *Saw-fly* (Nematus Sp.) defoliated many fine groves of birch (mostly *Betula papyrifera* and *B. populifolia*).

Insects Observed at the Port of Montreal. Mr. Merritt Baker, Fruit Division, Ottawa, who is in charge of the inspection of apples at the port of Montreal in connection with the inforcement of the Fruit Marks Act informs me that the three most important insects which he has observed in the course of his inspection are the Codling Moth, the Plum Maggot and the Lesser Apple-Worm. The apples which he examined came mostly from the Lake Ontario District, Ontario. The Lesser Apple Worm (*Enar-*

monia prunivora) is an insect which deserves more attention than it has usually received. It is probable that many of the injuries which have been done by this insect have been attributed to the young codling worms. This insect usually bores just below the skin at the blossom end of the apple, or at the point where two apples are in contact. The effect produced is a sunken area, somewhat irregular in outline, still covered by the dead skin of the apple. Observations show that it rarely bores into the fruit very far; never exceeding half an inch. Mr. Baker states that the injury to the apple may continue after the fruit has been packed in barrels. Dr. Felt, New York State Entomologist, states that it works also upon the domestic variety of plums. In appearance, the lesser Apple Worm resembles somewhat the Codling Worm. It is very probable—although direct experiments have not been conducted to test the effectiveness of the remedy—that this insect can be controlled by the same applications as those adopted against the Codling Moth.

The Apple Maggot or Railroad Worm (Rhagoletis pomonella) has become one of our most serious apple pests. It does not appear to be widely distributed as yet. It appears locally in several districts, and does not seem to have the faculty of spreading far from that locality. The insect winters over as a little brown oval puparium, either on the surface of the ground or at the bottom of barrels containing apples. The adults emerge very regularly throughout the season, from early July up into September, so that they affect both early and late-maturing apples. The adult is a blackish two-winged fly, a little smaller than a common house fly, and may be recognized by the narrow, white bands on its abdomen, and by the four black bands across its wings. The eggs are deposited under the skin of the apple, and the young maggots hatch within a week and begin burrowing and making channels in the developing apple. It seems as if the maggot does not emerge until the apple is matured; there is therefore great danger that many apples which appear quite free from injury when picked and packed in barrels will show serious injuries when the barrels are opened. There is but one brood each season. As spraying has little or no effect in controlling this insect the best methods of control are the gathering and destroying of the fallen apples, which contain the maggot, and the cultivation of the soil in the orchard, at intervals early in the summer, before 1st July, to destroy the pupæ in the soil.

THE FARMER'S WOOD LOT.

By Rev. Thomas W. Fyles, D.C.L., Levis, P. Que.

"How dear to this heart are the scenes of my childhood,
When fond recollection presents them to view:
The orchard, the meadow, *the deep tangled wild-wood*,
And ev'ry loved spot that my infancy knew."

Many a man who, in early life, left his father's homestead to try his fortune far away, has listened to the song of "The Old Oaken Bucket" with keen emotion.

It is the nature of man to

"look before and after,
And sigh for what is not."

And, in his leisure moments, when wearied with the turmoil of the busy world, the fancy of the exile from home will often revert to the scenes of his early life.

Among the cherished recollections of such a one will be the Wood Lot, with its stately trees, its pleasant glades, its cool retreats.

He will think of its hazel copses, its blackberry tangles, its furred and feathered denizens, its wealth of flowers.

He can call to mind its appearance in the early summer, when all the trees of the wood rejoice before the Lord, when the delicate green of the young foliage was relieved by the yellow catkins of the birches and the darker hues of the pines.

The glories of its autumnal tints will also present themselves to his fond remembrance—the splendid crimson and gold of its maples, the Indian yellow of its beeches, the rich rosy bronze of its oaks.

It will seem to him as if the woodland were wont to don its richest robes, to bid adieu to summer with befitting state.

Amid such scenes he received his first lessons in wood-craft, and learned to call the trees by their names, and to distinguish each kind by its peculiarities, and to know the timber of each by its grain, and to tell the uses for which it was adapted.

There he learned to admire the inexhaustible resources of the Divine Creator revealed on every hand, and the marvellous—to speak paradoxically—diversity in uniformity under which no two leaves of one tree exactly agree in all points of outline and venation.

Then, it may be his thought will revert to his early companions, and their frolics in the woods and sugar-house. He can recall the names, the features, the characteristics of his early friends; and he may wonder whither their several paths in life have led them.

But dearest to his fond recollection—dear and yet sorrowful—will be the remembrance of the home circle. He will think of his parents now laid to rest, it may be, in a selected spot of their own land; and he will perhaps view, with shame and regret, his conduct in leaving the old folk to carry on the farm, in their declining years, without the aid of his youthful energy and strong right arm.

"It is true," our friend may say to himself, "that the farm was less productive than it had been, that the prices of produce were low, and the general outlook somewhat gloomy; but observation has since taught me, that, as the population has increased, the prices of produce have risen, that new railways have given access to better markets, that such noble institutions as the Ontario Agricultural College at Guelph, and the Macdonald College at Ste. Anne de Bellevue, have made known that more can be done with, and made from, the land than our fathers were aware of. If I could have had the advantage of a training, such as these colleges afford, my ambition would have been aroused, and I would have staid by the land and made it profitable. And what nobler business can a man undertake! The cultivation of the soil was the work appointed for Adam by his Maker. The occupations of the farmer have not unfitted men for high endeavours. Stock-raising was the business of Abraham, the father of the faithful, the friend of God: the prophet Amos was a herdsman; it was from the sheep-fold that God took His servant David away, that he might feed Jacob His people, and Israel His inheritance. It was from the plough that Cincinnatus was called to the Dictatorship; and the poet, Horace, delighted in his Sabine farm."

But, leaving our city man to his cogitations, let us now make some observations on the wood lot for ourselves.

I do not in this article refer to the White Birch allotments that may be seen on the French Canadian farms around Montreal, nor to the Spruce growth on many of our northern farms; though these have their interesting features. I have in mind the mixed growth, remains of the old forest that

once covered the land: such as may be seen on the rougher portions of farms, in parts of the Eastern Townships and the New England States.

The *aristocracy*, so to speak, among the trees of such wood-lots are the lordly pine, the sturdy hemlock, the stately yellow birch, and the basswood beloved of bees. These rise, straight and tall, amid the numerous spruces, balsams, tamaracks, elms, maples, beeches, poplars and balm-of-Gileads.

Among all these fine and useful trees are others of smaller growth: thorns, hornbeams, amelanchiers, moosemissies, etc.

Stand with me in such a wood, and see the tall pines, with their spreading layers of foliage rising tier above tier; the graceful balsams, like church-spires pointing heavenward; the vase-like contour of the elms.

Time would fail us to consider the peculiarities and uses of many of the trees—let us observe those of *one* genus, that of *Fraxinus*, the Ash.

Of the six kinds of Ash accredited by Grey to North America, three are found commonly in Canada:

The White Ash, *Fraxinus Americana;*

The Red Ash, *Fraxinus pubescens;*

The Black Ash, *Fraxinus sambucifolia.*

The fruit of each of these is a Samara, or winged seed, and the leaves are compound leaves, and these afford distinguishing features for the three kinds I have mentioned.

In the *White Ash* the stalks of the leaflets are smooth and glabrous.

In the *Red*, they are softly pubescent.

In the *Black*, the leaflets have no stalks—they are sessile.

Again:—

The seed of the *White Ash* is winged from the apex only.

In the *Red*, the seed is edged on either side; and the edges gradually expand into the wing.

In the *Black*, the seed is winged all round.

These seeds hang in clusters. The children in England call them locks and keys.

The White Ash is a valuable shade tree. Its symmetrical stem, its graceful contour, and its elegant foliage render it a favorite for the lawn or park.

Then it is remarkably free from insects. In North America some 500 kinds of insects feed upon the oak; but about 50 only feed upon the ash; and of these very few can be said to be injurious or offensive.

The wood of the White Ash, on account of its toughness, its close grain, and its freedom from flaws, is valuable for the construction of carriages, farm vehicles and implements.

The wood of the Black Ash is useful for other purposes. Bars of it are well soaked, and pounded with mallets. They can then be rent into fine strips for basket work and bottoming of chairs.

Let us now turn our thoughts for a few moments to the sentient things around us.

I dare say you noticed when we entered the wood-lot that a sentinel-crow sounded an alarm—and now a dead silence seems to have fallen on the woodland. Let us sit on this log till the inhabitants of the wood have regained confidence. Meanwhile, I will say a few words about the crows.

The crows build frequently in spruce trees. The dense foliage of these trees hides their nest. I had the curiosity to climb to a nest some years ago; and I was rewarded for my pains, for a strange nest I found it. The

builders had stolen a whole length of clothes-line, and with great ingenuity had wound the cord round and round, and between the young branches of the tree, making a very firm basis for their nest.

You all know that the first egg of a pullet is sometimes very small: the mother crow, whose nest I invaded, must have been a yearling bird, for there was in the nest one very diminutive egg, with others of the usual size.

Ah, our patience is meeting with its reward—the birds and animals are no longer silent.

There is an oriole wending its way to its nest that we saw suspended from the extremity of an elm bough on the verge of the wood.

And yonder, near the top of that tall hemlock stump, a Golden-winged Wood-pecker (*Colaptes duratus*) is busy enlarging a hole in which to make its nest. What a litter he is making! "The carpenter is known by his chips." Now he flies away. Observe the graceful curves of his flight, and notice his peculiar call, which suggested the common name by which he is known—"Wake-up."

The stump he was operating upon must be fourteen feet high. Its top shews that *the axe* had severed it from the upper portion of the tree. How did the woodman find standing room for his work? The explanation is this:—the tree was blown down in some fierce gale. It tore from the ground, on all sides but one, a mass of roots, charged heavily with soil and stones, and leaving a deep hollow in the earth. The farmer came; peeled off the bark as far as the branches; cut off the limbs and top; then marked the trunk into lengths. He stept up on the tree, and standing with feet wide apart, chopped off standard logs—one—two—three. As the third log fell, he felt the butt, on which he was standing, beginning to move. He jumped, and so doing, escaped from being shot, as from a catapult, yards away. The counter weight being gone, the heavy mass of roots, with the stump in place, fell back into its matrix with a thud.

See yonder in the maples a pair of grey squirrels. What a frolic they are having! Chasing each other as if they were playing "tag," their long tails extended, or curved gracefully over their backs. Those tails serve them for Winter blankets. The little creatures, in their snug retreats, during the cold weather lie closely curled, and wrapped by their soft tails, heedless of wind and storm. They are sportive enough now—bye-and-bye, when Autumn is well advanced, they will be busy collecting beech nuts, acorns and butter nuts for their Winter supplies.

The butter nuts are truly to the squirrels *Juglans*—Jovis glans—Jupiter's nuts—the provision made by Providence for their Winter's need.

On the other side of us a red squirrel is scolding—"*chuck, chuck.*" I have lost my liking for this little animal ever since I saw one of its kind tearing to pieces the callow young from a young bird's nest that it had discovered.

Yonder runs the prettily striped ground squirrel or "chipmunk." One evening in the first year of my residence in Canada, I walked out from Montreal, where I was then living, to Cote des Neiges. There I encountered half a dozen boys who were greatly excited. Some of them had sticks in their hands; some large stones; all were eagerly searching the stone fences. "What are you hunting?" I asked. "A chipmunk! A chipmunk! !" they shouted. and away they ran. I had never before heard the name. I wondered what ferocious beast was known under the strange appellation.

I was as perplexed as the tourist who came to Quebec to view the Winter scenery. He was a man of more leisure and means than wit. He put up at the St. Louis Hotel, and in the afternoon walked out to the Plains.

He admired the pure unbroken expanse of snow and the fine view over the St. Lawrence and towards St. Jean Chrysostom. Next morning he arose early and took the same course to gain an appetite for breakfast. When lo, he saw some strange tracks in the snow. They were very large, and there was something like the imprint of a spur behind each of them. While he stood greatly puzzled, an old Scotchman drove along on a traineau. Our friend stopped him; and the following colloquy occurred:—

"Can you tell me, Sir, what made these tracks?"

"The snaw-shus."

"What huge tracks! They come from the woods" (pointing towards Wolfe's Field).

"O aye, that' awa."

"They came in the night?"

"Like as not."

"And they go towards the town. Ar'n't the people afraid "

"Na', na'. They're used to them."

And he drove on.

Out came the stranger's note book; and he wrote:—

"The Great Snortshius, a strange creature with huge feet, comes from the woods in the night, and passes into the town; and the people are not terrified. I must enquire further."

So I felt about the chipmunk. I must enquire further; and I did.

The chipmunks and field mice are very mischievious. Towards Spring when their Winter storm of provisions have run short, and when the snow next the earth has melted, leaving run-ways amidst the buried brush, the little animals follow these passages till they come to the young maples, that the farmer has been preserving to form a second growth sugary. They gnaw the bark of the trees near the ground. After a long Winter I have seen scores of young trees completely girdled and destroyed by them. If a young orchard is near the creatures are apt to serve the fruit trees in the same way. Lengths of stove pipe unhooked at the sides, and placed around the base of the trees, and then hooked together again, are a safeguard against the spoilers.

From our seat on the log we can observe many interesting things. Yonder runs a Ruffed Grouse or partridge. It probably has its nest at the foot of some neighbouring tree. The nest is but a slight hollow in a dry spot. The bird lays many eggs. She sits close; and her colour and markings so resemble her surroundings that she is seldom noticed by a passer-by. Her young can run as soon as they are hatched.

I have witnessed a strange device that the partridge has of escaping its foes in the Winter.

I was standing beside a church which was built near such a wood lot as we are considering. The snow lay deep on the ground, and was drifted against the edifice. Suddenly a pair of partridges whirled rapidly round the gable of the building. They were unaware of my presence till they came upon me. I could have touched them but they dived with startling rapidity into the drift beside me, scattering the light snow all around as they passed in, and so completely closing up their passage way that I could not tell the exact spot where they had entered, though it was not more than three yards from me.

Representatives of the insect world are on the wing, or sunning themselves on the foliage. There is *Polygonia faunus*, Edwards, the most beautiful of our Graptadæ. Notice the rich mottling of its under side. There, too, is *Basilarchia arthemis*, one of the finest of our butterflies. The dark

purple of its upper surface is banded with pure white and adorned with orange spots and blue crescents. The larvæ of these lovely butterflies feed upon the elm, willow, etc., and they do little, if any, harm.

But we must not dwell upon the inoffensive insects, however beautiful. Let me draw your attention for a moment to creatures that work in darkness, to the injury of the trees. Some of these belong to the HYMENOPTERA: *Tremex columba*, Drury (Fig. 41); *Uroceros albicornis*, Fabricius; *U. cyaneus*, Fabricius; *U. flavicornis*, Fabricius. They are large, handsome, but formidable looking flies. Their larvæ tunnel in various trees and do much damage. Fortunately their number are kept down by several species of even more dangerous-looking ichneumons: *Thalessa atrata*, Fab.; *T. lunator*, Fab.; *T. nortoni*, Cresson, &c. The larvæ of these follow up the larvæ of the others and devour them. Many a tragedy, that we know not of, is done in the darkness.

Fig. 41. Pigeon-tremex—the Horn-tail borer—(*Tremex Columba.*)

The larvæ of many beetles are borers. I dare say that this log on which we are sitting is bored through and through by the larvæ of *Orthosoma brunneum*, Forster.

We do not greatly wonder that larvæ of some of the four-winged flies, and of some of the beetles should bore in timber; but it does seem remarkable that larvæ of some of our moths should do the same.

Yet the larvæ of *Cossus centerensis*, Lintner, bore in the Balsam Poplar; the larvæ of *Prionoxystus robiniæ*, Peck, bore in the locust; the larvæ of *Prionoxystus Macmurtrei*, G.-M., bore in the oak; the larvæ of *Ægeria apiformis*, Clerck, bore in the willow; the larvæ of *Sesia acerni*, Clemens, bore in the maple; and there are others of like habits.

Turning our attention to the trees again. There is a White Cedar. Cedar is not plentiful on the Eastern Township farms. The man who owns a cedar swamp owns a mine of wealth for Cedar is of great value for shingles. There are, however, extensive tracts of cedar elsewhere. At Grand Metis, a company, called the "Grand Metis Lumber Company" is operating. This firm cuts, I am told, from 150,000 to 200,000 logs per year, out of which they manufacture from 50,000,000 to 65,000,000 shingles in the same period. They ship their output by rail to the New England States. One thousand feet, log measure, will yield about 8,000 shingles (32 bundles of 250 shingles each).

First quality shingles are worth from $4.00 to $4.35 per thousand, delivered at New England points. The duty at the border is 30 cents per thousand.

Cedar, to the lumber firms, is about twice as remunerative as spruce.

The White Birch is another valuable tree. The spools which are of use all over the world are made from its wood.

There are districts in which the White Birch (or "Bouleau," as the French call it) grows abundantly. Such a tract is that from Matane to Cap Chat, on the south coast of the St. Lawrence.

The firm operating in that part of the country is James Richardson & Co.

The timber is sawn into strips 1½ to 6 feet long, 2 inches broad, 2 inches deep. The white wood only is used; the heart wood is laid aside for fuel.

The strips of white wood are tied up in bundles, and shipped from Matane, in Norwegian sailing vessels, to Coats & Co., of Glasgow, who with some associated companies have the spool business entirely in their own hands.

The vessels that convey the spool wood to Scotland, when taking in cargo at Matane lie half a mile, or more, from the shore; and the lumber is carried out to them in scows, open boats and schooners. 3,000,000 feet of spool-wood board measure is exported from the Matane district every year.

Observe that small tree with blossoms resembling hops. It is the Hop Hornbeam or Iron Wood (*Ostrua virginica*). Young trees of this kind and young ash trees furnish the farmer with levers firm and good.

Speaking of levers, this incident came under my observation some years ago:—A farmer made a "Bee" for the purpose of drawing sawlogs to the mill. The neighbours came. On entering the wood, those who were not already supplied cut levers for themselves. An emigrant, who had been engaged by one of the men, observing this, cut a lever for himself. The work commenced. The emigrant made a great show of strenuous effort—it was but a show. The man beside him called out, "Lift man, lift!" Then he added, "Let me see your pry." Holding this up, he shouted, "A basswood! A basswood!" A roar of contemptuous laughter followed from the other men. The immigrant stood amazed. In his ignorance of the nature of the wood, he did not know that his pretentious ineffectiveness had been exposed.

Even the bushes around us are worthy of attention. There is the Moosewood, also called Wicopy (*Dirca palustris*). You cannot break a stick of it—the rind is too tough; but the wood, when peeled, is remarkably brittle. The farmers, when short of string, use strips of the bark, which is pliant as well as tough, for tying up the mouths of their sacks of grain, etc.

As we make for home, let us consider the condition of things in some parts of the country.

It is grievous to see the way in which farms are often mismanaged. Men with little means and less judgment, buy farms "on time" at more than their value. To meet their payments these men have to part with everything that will bring money. They have not wherewithal to purchase sufficient stock; and they sell the hay off their land year after year, impoverishing the farms more and more. They cut down their woods, and sell the maple for fuel, and the spruce for pulp wood. Where there are chemical works within reach the denudation of the land goes on rapidly, for hard wood is in demand for the distillation of wood alcohol, and other wood for feeding the furnaces in the work. By and bye the farm will be so unproductive that the owner will have to leave it.

According to the latest reports there are in Rhode Island 228 abandoned farms. In Massachusetts the abandoned and waste land amounts to one-tenth the total area of the state. But wealthy and intelligent men are now buying up the abandoned tracts and planting them with trees. One of them this year has planted 63 acres with white pine, and intends to plant 50 acres per year for the next ten years. See the "Richford Gazette" for October 9th, 1908.

Our own people should seize every suitable opportunity for tree-planting. They should put in trees for wind-breaks to their homesteads and orchards, shade trees for their roadsides, ornamental trees for their lawns and parks, young fruit trees to supply gaps in their orchards, young maples to keep up their sugar woods, useful trees in every waste spot.

In conclusion I would impress upon your minds the advice of an old North Countryman:

" Be aye stickin' in a tree.
'Twill be upwards creepin'
While ye are a-sleepin'.

LIFE HISTORY OF EUCHÆTIAS OREGONENSIS (Stretch).

By Henry H. Lyman, M.A., Montreal.

On 10th July, 1898, I had a day's collecting in High Park on the western outskirts of Toronto.

Neonympha Canthus was abundant in the moist hollows and *Satyrus Nephele* was also flying. *Thecla Edwardsii* and *Lycaena Scudderi* were common, the former on *Ceanothus Americanus* a low spreading shrub with white flowers, and the latter coquetting with the blue flowers of the harebell. *Thecla Acadica* was also flying with *Edwardsii* and *L. Neglecta*, *P. Troilus*, much worn, *P. Nycteis*, *Plusia Simplex*, brown form, were also taken while *L. Arthemis*, *P. Oleracea*, presumably of second brood, were seen, as well as *D. Archippus* from the south leisurely ovipositing.

While collecting the Theclas a white moth came flying around the same plant and was taken. I saw it was a species of Euchætias new to me and as it was a female I kept it alive to secure eggs if possible. I subsequently learned that it was *Oregonensis*, but it had lost all the pale drab tone of the primaries and was practically white.

Eggs, round, gum-drop shape, about as high as the diameter, which is .83 mm., shiny, but showing minute facets under a 2-inch power. Colour, honey-yellow when laid, turning dark lead colour just before hatching.

Began hatching 18th July, and all but one were out on 19th. Egg period about 8 days.

Young larva, length including forked tail 2.33 mm., the forked tail being .17 mm. This forked tail seemed marked under the microscope, but when larva was examined with ordinary pocket magnifier on 21st, after it had fed the forking seemed less conspicuous.

Head, rounded above, brown, darker on upper lobes, the lower part and median suture pale, with a few short hairs. Body after feeding green, yellowish-brown about warts which are dark brown or black. Setæ mostly long, black; cervical shield brown. Wart III. on abdominal segments has two setæ. The setæ on 4th segment are larger than on middle segments and project forward. On 5th segment the upper setæ are nearly twice as long as on middle segments. On 11th to 13th segments they are also longer than on the middle ones, those on 12th and 13th being longer than on the 11th. Feet, dark brown, claspers greenish.

For a wonder the specimen described kept quite still while its description was being taken. The larvæ on hatching were placed on *Asclepias*, but did not fancy it. Mr. Winn suggested Dogbane (*Apocynum Androsæmifolium*) which was then supplied and accepted by the larvæ as satisfactory.

On 22nd July they began passing first moult, the length after the moult being 4.7 mm.

As I was leaving town early in the morning of Saturday, the 23rd to spend Sunday at Lake Memphremagog, I merely took the length expecting to be able to take the rest of the description on my return, but on the 26th recorded in my note book that the second moult had already been passed and made the following description:

Stage III., after second moult. Length 8.6 mm. Head, rather small, rounded above, yellow, the ocelli, brown.

Body, rather plump, greenish yellow, with a green dorsal stripe, more conspicuous on the abdominal segments. Hairs spreading, a few longer than the others on some of the anterior and posterior segments, yellowish. The lateral warts seem to be placed in depressions. Feet and claspers, yellowish.

These larvæ matured very rapidly and on 28th the third moult was being passed.

Stage IV., after third moult. Length before feeding about the same as when last taken.

Head, yellow, mouth parts brownish. Body greenish yellow, the pulsating vessicle showing as a green line. Hairs, long and silky, overhanging the head and anal extremity, light yellowish. Anal claspers, rather small and spreading. Feet and claspers, pale yellowish.

The caterpillar under observation which had just passed the moult stood on its central abdominal claspers and raised both extremities, back to back, brushing them together to adjust the hairs. This it did repeatedly and with so much energy that it lost its hold and fell off the leaf.

On 31st July all but two had passed the fourth moult.

Stage V., after fourth moult. Length, 12.5 to 14 mm. Head, yellow, with tinge of orange, ocelli dark brown or black. Except when feeding or in motion the head is concealed by the hairs of the second and third segments which overhang it. Body, pale greenish, the spreading hairs greenish yellow. There are a number of long hairs on the segment projecting forward over the head, and a few on the third and fourth segments which stand straight up or project slightly forward. These hairs are from three to four times as long as the other hairs. There are also a number of similar long hairs on the 11th, 12th and 13th segments which slope towards the rear.

While I was describing these, at least about a half of them roused themselves and began running about, especially around the rim of the jar, stopping every few seconds and sounding with their feet, raising the thoracic segments and striking a number of times and then going on again. They sometimes crawled part way down the outside of the jar, but generally crawled up again, not showing any disposition to go far from home. Two, however, crawled down to the table, but one of these crawled upon the tin cover of the jar and rested there.

On 1st August two were found to have passed the fifth moult, but no change in size was apparent.

As I was leaving that evening for a brief trip to Tadousac on the lower St. Lawrence I had no time to make any detailed description of Stage VI.

On 5th August the larvæ were passing the sixth and last moult and changing their appearance considerably, but also showing a good deal of variation. Some were mouse-gray all but the head which was still honey-yellow, while others were gray as to the skin, but with yellowish hairs and some had yellowish hairs with a few mouse-gray ones mixed in.

These larvæ were perfectly healthy up to the time of my leaving Tadousac for home on the evening of 7th August. They had been perfectly

easy to rear, developed rapidly and none had been lost, but I doubtless made the mistake of not separating them sufficiently as they approached maturity for on my arrival home on the morning of 9th August I found that a choleraic disease had broken out among them and several were dead. I immediately separated them into a number of jars which I had washed with a disinfecting solution of permanganate of potash, putting those that seemed quite healthy by themselves and those under suspicion by themselves.

On 12th August one of those under suspicion spun a rather flimsy gray cocoon weaving in the hairs of its body, but by 21st August all the others had died in spite of all the care that was lavished upon them. Afterwards I found that the one which had spun its cocoon had not had sufficient vitality to pupate.

I thus succeeded in working out the life history of the species, though my cabinet was not enriched with any bred specimens.

Diameter of larval faces of the first six stages were .41, .58, .80, 1.12, 1.38, 1.67 mm.

DR. JAMES FLETCHER.

It is with the most profound regret that we record the death of our very dear friend, Dr. James Fletcher, which occurred on Sunday morning, November 8th. For the last two years his health had not been entirely satisfactory and for more than a twelve month he had been troubled more or less with an internal hemorrhage which caused him much inconvenience and discomfort at times, but which he did not regard as particularly serious. His cheery habit of mind caused him to treat lightly symptoms which would in most cases have excited much alarm. In the middle of September he went out to British Columbia on his annual visit and was absent from home for about six weeks. On his return his colleagues noticed that he had not benefited as much as usual by the trip, and that his appearance was by no means robust. But with characteristic energy he at once set to work to make the arrangements for the Annual Meeting of the Entomological Society of Canada, which he desired should be one of the most successful in its history. As President for the second year in succession, he expected to retire from office, but fully counted upon being present at Guelph and occupying the chair at the various sessions which were held on November the 5th and 6th. During the preceding week, however, he wrote saying that he was going to Montreal to consult a specialist, and might after all be unable to attend. He went down on Saturday the 31st of October, and was at once sent to the Royal Victoria Hospital, there to prepare for an operation. To the writer he sent a letter the following day expressing his great disappointment at being laid up and prevented from coming to Guelph, but full of confidence in the wonderful power of modern surgery and with apparently no fears as to the result. The operation took place on the following Saturday, but he failed, owing to his weak condition, to rally from it and the next morning he died. The operation revealed that he had been suffering for some time from a malignant tumour which had sapped his vitality and would very soon in any case have brought his life to a close. Up to the end he was cheerful and uncomplaining, free from despondency or anxiety about himself, and full of the happy optimism which had always been one of his charming characteristics.

Few men ever made so many loving friends in all walks of life; every one who came to know him could not fail to become warmly attached to him. There are many sad hearts grieving at his loss all over the Dominion of Canada and many, too, in widely scattered places in the United States. Old and young, rich and poor, learned or ignorant, children and their elders, it made no difference—he had a kindly word for each one and most can treasure in their memories a kindly deed as well. When he addressed a meeting he captivated his audience at once and when he joined an excursion of nature students all were eager to be with him, and learn from him some of the secrets of the woods and fields that he knew so well. We shall not see his like again, but we may all feel that it was good for us to have known him—his memory will long live in our hearts—his noble words and generous deeds will be happy recollections for many a year to come.

Dr. James Fletcher was born at Ashe in the County of Kent, England, on March 28th, 1852. He was educated at King's School, Rochester, and came to Canada in 1874 to fill the position of a clerk in the Bank of British North America. Finding the work uncongenial after two years, he gave it up and became an assistant in the Library of Parliament at Ottawa. All his spare time he devoted to Botany and Entomology and became as years went on a recognized authority in each of thse branches of natural science. This led to his appointment as honorary Dominion Entomologist and Botanist and a year or two later to his taking up the work of these departments at the newly established experimental farm. This was in 1887 and for twenty-one years he has been a highly valued assistant to Dr. Saunders, the director, and long since became known throughout North America as one of the ablest scientific men of the day in his special departments.

In 1878 he became a member of the Council of the Entomological Society of Ontario, and every year since he has been elected to hold some office in it, being four times Vice-President, and President for three years, from 1886 to 1888 and again from 1906 to the time of his death, when he had just been re-elected for another year. His first contribution to the Society's publications was an article on Canadian Buprestidæ, which was published in the Annual Report for 1878, and his first contribution to "The Canadian Entomologist" appeared in January, 1880. During all the years that have followed no volume of either publication has been issued without some valuable articles from his pen.

In 1879 he was one of the originators of the Ottawa Field Naturalists' Club, the most successful society of the kind in the Dominion, and more recently he suggested, and by his energy and influence accomplished, the formation of the important Association of Economic Entomologists of North America, of which he was elected President in 1892. He was also one of the original Fellows of the recently formed Entomological Society of America, and was First Vice-President last year. In 1886 he became a Fellow of the Linnæan Society, of London, and in 1896 he received the degree of LL.D., *Honoris causa*, from Queen's University.

In 1885 he was elected a Fellow of the Royal Society of Canada; in 1895 he became President of Section IV., which is devoted to Geological and Biological Sciences. For many years he was Honorary Treasurer of the Society, and for the last two years Honorary Secretary. To the transactions of the Royal Society he contributed the following papers: Presidential Address, 1895, on Practical Entomology; Recent Additions to the list of Injurious Insects of Canada, 1899; The Value of Nature Study in Education, 1901; Descriptions of some new Species and Varieties of Canadian Butterflies, 1903; Notes on the Preparatory Stages of some Species of Canadian Lepidoptera, 1907.

A list of his contributions to scientific and agricultural journals would occupy many pages, if such a list could be completely carried out. His most valuable publications were his annual reports on the work of his department at the Central Experimental Farm and the Bulletins in connection with it, in which he gave accurate detailed descriptions of a large number of injurious insects, and also his papers in the Annual Reports to the Legislature of the Entomological Society of Ontario. Two years ago he completed an admirable work on the Farm Weeds of Canada, containing descriptions of all the most important weeds that are a trouble to agriculturists throughout the Dominion; a handsome quarto volume illustrated with 56 beautiful coloured plates.

Not only with his pen, however, did he perform useful work, but with his voice as well. He was in great demand as a public speaker at Agricultural, Horticultural, and Fruit-growers' conventions, meetings of Farmers' Institutes and other gatherings. On these occasions he at once secured the attention of his audience and charmed them with his graceful language and lively humour. No one else, indeed, has done so much for Canada in instructing the people in a practical knowledge of their worst insect foes and the best methods of dealing with them. His work has thus been of vast importance not only to those directly interested in the products of the soil, but indirectly to all the dwellers within the domains of this wide Dominion.

Though so fully occupied with scientific work he yet found time for other things. He was one of the most efficient members of St. Luke's Hospital board; for many years lay-reader and superintendent of the Sunday school in Holy Trinity Church, Archville, a suburb of Ottawa; and an active member of the St. Andrew's Brotherhood. His religious life as a devout son of the Church of England was known perhaps to but few amongst his intimate friends, though manifested in many ways through his goodness of heart; he lived and died an earnest, God-fearing man, devout and upright, filled with unobtrusive piety, a sincere Christian indeed "in whom was no guile."

While we deplore the loss that we all feel we have individually sustained, we desire to express to his sorrowing family, Mrs. Fletcher and her two daughters, the deepest sympathy with them in their sad bereavement. To them the loss is beyond all words, but it may afford them a ray of comfort to know that he whom now they mourn was so widely beloved, admired and respected and that so many friends share in their grief and are filled with sorrow for him who is gone.

C. J. S. Bethune.

Dr. L. O. Howard, Chief of the Bureau of Entomology in the Department of Agriculture at Washington, a friend of many years standing, writes as follows:

"Dr. Fletcher's services to his country were very great. He had a wonderful grasp of a very broad field in Entomology, and was one of the best-informed men of his time on the intricate and manifold aspects of economic Entomology. His reports were sound and practical, and as a public speaker before assemblages of agriculturists and horticulturists he was unexcelled. His address years ago before the National Geographic Society in Washington, on the Canadian Northwest, was one of the most perfect lectures I ever

heard. He was known, admired and loved all through the States. In fact, I have never known a man who had so many absolutely devoted friends as Dr. Fletcher. His energy, his enthusiasm, his absorbing interest in everything that lives and grows, his warm heart, his cheeriness, his perfect lack of even a suspicion of egotism, attracted every one who knew him, and bound them to him in friendship, and even love, forever. Here in Washington among the Entomologists and others there are many sad hearts to-day."

DR. WILLIAM H. ASHMEAD.

On the 17th of October Dr. William Ashmead died in Washington, D.C., aged 53 years. For more than a year he was in such an unsatisfactory state of health that his recovery appeared impossible and it was therefore no surprise to learn that the end had at last arrived. His break down in the midst of a career of scientific usefulness was evidently brought about by overwork; he devoted himself with such intensity to the study of the Hymenoptera and the publication of the results that he gave himself no rest and literally wore himself out, to the grief and distress of his family and many friends.

For close upon thirty years he was a constant contributor to the pages of "The Canadian Entomologist," his first articles on insects affecting the orange, having appeared in 1879. At that time he lived in Jacksonville, Florida, where he was engaged in the publishing business, which included the issue of a daily paper and a weekly agricultural journal. He was naturally much interested in the production of oranges and his attention thus became drawn to the insects injuring the trees and fruit and those parasitic forms that somewhat keep them in check. His work was so thorough that he was made a field Entomologist for the United States Department of Agriculture in 1887, and began his career as a professional Entomologist.

In 1890 he went to Germany and studied for some time in Berlin, thus becoming qualified for the performance of scientific work of a high character. In July, 1897, he was appointed a Curator of the Department of Insects in the United States National Museum at Washington, and continued to hold the position till incapacitated by illness.

In October, 1904, he was elected an "Honorary Member of the Entomological Society of Ontario in recognition of his eminence in the science and the valuable contributions that he so constantly made to the pages of the "Canadian Entomologist." His studies were devoted to the Hymenoptera, and he published many systematic papers on various super-families in the order and described a large number of genera and species. His work was of such a high character that it is regarded as authoritative and has attracted the attention of the leading Entomologist of both Europe and America. One of his completed works is his Monograph of the Proctotrypidæ, a volume of nearly 500 pages published in 1893. Most of his papers are to be found in the Transactions of the American Entomological Society of Philadelphia and in the Canadian Entomologist.

He received the honourary degree of Doctor of Science from the Western University of Pennsylvania and was the recipient of many distinctions from various Entomological Societies. Personally he was esteemed and beloved by all who knew him and there are many who now deplore his loss.

C. J. S. B.

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ANNUAL REPORT

OF THE

Bee-Keepers' Association

OF THE

Province of Ontario

1908

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1909

WARWICK BRO'S & RUTTER, Limited, Printers
TORONTO.

To the Honourable JOHN MORISON GIBSON, K.C., LL.D., ETC., ETC., ETC.

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of The Ontario Bee-Keepers' Association for 1908.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

TORONTO, 1909.

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Ontario Bee-Keepers' Association.

OFFICERS FOR 1909.

President ..... Wm. Couse ..... Streetsville.
1st Vice-President ..... W. J. Craig ..... Brantford.
2nd Vice-President ..... D. Nolan ..... Newton-Robinson.
Secretary ..... P. W. Hodgetts ..... Parliament Buildings, Toronto.
Treasurer ..... Martin Emigh ..... Holbrook.

Directors:

1. Alex. Dickson, Lancaster.
2. A. McLaughlin, Cumberland.
3. H. E. Eyre, Chantry.
4. R. Lowey, Cherry Valley.
5. Jas. Storer, Lindsay.
6. Wm. Couse, Streetsville.
7. J. M. Switzer, Orangeville.
8. U. H. Bowen, Niagara Falls.
9. W. J. Craig, Brantford.
10. D. Chalmers, Poole.
11. W. Chrysler, Chatham.
12. D. Nolan, Newton-Robinson.

Ontario Agricultural College: T. D. Jarvis, Guelph.
Auditor: J. H. Thomson, Britannia.

Committees:

Executive: President, 1st and 2nd Vice-Presidents.
Show: President and Secretary, with E. Grainger, H. G. Sibbald.
Honey Crop: President and Secretary, with W. J. Craig and H. G. Sibbald.
Transportation: President and Secretary, with J. D. Evans.

Representatives to Fair Boards:

Toronto Industrial: J. D. Evans, Islington.
Ottawa Central: W. J. Brown, Chard.
London Western: F. J. Miller, Ealing P. O., London.

FINANCIAL STATEMENT.

FOR THE YEAR ENDING NOVEMBER 11, 1908.

Receipts.		*Expenditures.*	
Balance on hand	$244 58	Grants to affiliated Societies	$220 00
Members' fees	95 10	Prizes to the Ontario Horticultural Exhibition	88 13
Legislative grant	450 00	Prizes, Canadian National Exhibition	25 00
Affiliated Societies' fees	50 00	Expenses annual meeting	28 00
Entry fees	4 50	Salaries	25 00
		Expenses, directors and officers	108 70
		Postage	4 01
		Printing	50 85
		Periodicals to members	149 05
		Cost reporting	75 00
		Honey presented to King Edward VII.	7 50
		Executive, and other committees	33 70
		Superintending Honey Shows	18 00
		Auditor	2 00
		Balance on hand	9 24
Total	$844 18	Total	$844 18

Audited and found correct,

JOHN NEWTON,
Auditor.

DETAILS OF EXPENDITURE.

Affiliated Societies: Grants of $20.00 apiece to the following Associations: Brant, Oxford, Norfolk, Middlesex, York, Halton, Simcoe, Haldimand, Glengarry, Russell, Victoria	$220 00
Honey Show: Cash paid for prizes, 1907, $38.13; cash paid for prizes, 1908, $50.00; Superintendent, $18.00	$106 13
Annual Meeting: Caretaker of hall, $3.00; travelling expenses, S. D. House, $25.00; J. F. Switzer, $6.50; D. Chalmers, $7.25; D. Nolan, $6.10; J. Armstrong, $8.50; J. Storer, $6.25; R. Lowey, $9.00; W. J. Craig, $8.30; M. Emigh, $7.60; M. B. Holmes, $12.55; F. J. Miller, $8.15; W. J. Brown, $23.35; W. Couse, $5.15	$136 70
Salaries: Martin Emigh, Treasurer	25 00
Postage and Stationery: M. Emigh	4 01
Printing: Methodist Book Room, printing of spraying notices, stationery, envelopes, post cards, crop reports, etc.	50 85
Periodicals for Members: Canadian Bee Journal, subscriptions	149 05
Reporting: Geo. Angus	75 00
Committees: Travelling expenses, H. G. Sibbald, $7.00; M. B. Holmes, $10.90; Wm. Couse, $5.80; W. J. Craig, $3.00; Wm. Chrysler, $7.00	33 70
Incidentals: Prizes Canadian National Exhibition, $25.00; Honey sent to King Edward VII., $7.50; Auditor, $2.00	32 50

Ontario Bee-Keepers' Association.

The annual meeting of the Ontario Bee-keepers' Association was held in the County Council Chamber in the city of Toronto, on Wednesday, Thursday and Friday, November 11th, 12th and 13th, 1908.

At two o'clock p.m. on Wednesday, the President, Mr. F. J. Miller, London, Ont., took the chair, and, after calling the Convention to order, requested the Secretary, Mr. P. W. Hodgetts, to read the minutes of the last annual meeting. These minutes were read and adopted.

A resolution was moved by Mr. M. B. Holmes, seconded by Mr. E. Dickenson, and carried unanimously, expressing sympathy with the family of the late Samuel Wood, of Nottawa.

Mr. Storer referred with regret to the death of Mr. B. Davidson, also a member of the Association.

PRESIDENT'S ADDRESS.

By F. J. Miller, Ealing.

It is with the greatest pleasure that I again greet you in Convention for the discussion and profitable advancement of our chosen pursuit. May it lead to the adoption of the best in short cuts and advanced methods for future work. Herein lies the practical benefit to be derived from our meeting. Then there is the pleasurable side, which I hope will be enjoyed to the fullest. The past year, though not the brightest to the apiarist, has been an improvement over the preceding one, the panicky feeling as to prices which appeared in some districts early in the season has given place to a better tone and prices are remaining firm. Score one for our Crop Report Committee.

There should be greater interest taken in our Association work. Apathy in this shows us not to be alive to our best interests. Banded together in our work we are able to do infinitely more for ourselves as bee-keepers than by any other means. Then why not stir ourselves to greater activity that this Association may double its present membership, thereby doubling the Association's possibilities and powers in the interests of the bee-keepers of Ontario. Then our Association would rise to higher conditions, solving problems that at present remain just beyond our grasp.

As individual members, and also as an Association, we should deeply appreciate the aid given us by the Department of Agriculture, for the benefits derived to this and the affiliated societies in extending the usefulness of our meetings, and for providing the necessary means of carrying out the work so badly needed of proper inspection of apiaries.

Extra inspectors were again granted this year, and although the work was started late, there has been more territory covered; and not only do I believe, but I know, that the work accomplished during the past two years by the newly appointed inspectors is improving the conditions of apiculture.

I was unable to make a comparison in the number of diseased colonies found, as this was not recorded in last year's work. However, this would make no difference as so much of this year's work covered new and heretofore uninspected territory.

In conclusion, I wish to add a word as to the good work accomplished by our Crop Report Committee. In time this will be looked back to as having been the first steps in the line of successful marketing, and every apiarist receiving this crop report should act wisely in accordance with the suggestions given.

I thank you for your kind courtesy during the past year, and ask for your considerate attention and aid in carrying out the program now before us.

Mr. W. Couse, First Vice-President, in replying to the President's address said: The President, of course, is really a believer in short-cuts, and I don't think he would let me speak very long if I wanted to. (Laughter.) He has made reference to crops. I felt for some years that our crop of honey was not extra good, but the trouble has been that we have been looking for one hundred pounds per colony every year. I think we might come to the conclusion that we are getting a good crop if we get one hundred pounds per colony. This year a good many have not got that. I think the average is somewhere around sixty or seventy pounds. I think we aim a little high when we aim at one hundred pounds. As to the conditions of the bee-keeping industry in the country, I really don't think there are as many bees as there were a few years ago. I think a good many of the small bee-keepers have lost their bees. All the advances in bee-keeping have not been done in one year or ten years; it has been a good many years that people have been trying to get up into a better way of handling their bees, and these conventions are for the purpose of educating the people to do that. The President has made reference to banding ourselves together to do that kind of work. Now, it is a fact, I believe, that if we had no organization in Ontario, Ontario would not have held at all the reputation it holds to-day as to bee-keeping. We are not disappointed at all in the way that the Department of Agriculture has taken hold of and helped the bee-keepers of Ontario. They really feel that their position is a great one; that they have got the country that can produce almost everything that we need in the way of agricultural products, and of the best quality in all things.

In reference to the crop report, as I have said before, I have confidence in it. I don't know that we have ever been a cent out in all the crop reports we have made. I do not know that we have ever suggested that honey should be sold for nine or ten cents when it was not sold for these prices. This year when we simmered the whole thing down, it was found some sections had very little, while others had much; but we found there was no honey at all in the hands of the dealers. We based it on a good many grounds; and I believe from the reports that came back that the committee can be fairly accurate.

SIDE LIGHTS ON MARKETING

By A. C. Miller, Providence, R.I.

In an address entitled, "Side Lights on Marketing," Mr. Miller spoke of the help they were receiving in the United States through the working of the new National Pure Food law and the state laws covering the same matter. They were now getting rid of the competition from artificial and fed honeys, and could give more attention to the proper marketing of the product of their apiaries. Almost any person could keep a box of bees and get honey out of it, but when one wants to produce the best quality of honey at the lowest cost to compete with other sweets, it is a different proposition. People

are using more sugar to-day than ever in the history of the world, and more confections are competing very sharply with the use of honey. It is therefore of importance that bee-keepers should pay great attention to the proper marketing of their honey.

If you are selling comb honey, one should grade carefully. Never put fancy combs in the crate with poorer stock, nor light with dark combs. One successful New York producer sets up a sample fancy comb before his help, and whatever does not come up to the standard must be packed a grade lower.

With the extracted honey, one has more to consider. Color seems to be of first importance. In Toronto, white honey sells readily, while in Rhode Island the golden colored honey is the best shade for the market. When color is of importance, by blending a light and a dark honey, the correct color can be obtained.

Flavor also must be considered, and the blending is again of great value in correcting whatever is undesirable in the honeys that may pass through the hands of the larger producers in a season's operations.

A third point is the body. An excessively heavy bodied honey is not as desirable in the eastern markets as the honey which flows reasonably easy. People there want honey that will pour out as a syrup. By using very thin honeys a better blend is made than by keeping the honey thick.

In blending and in preparing honey generally for market, straining is one of the most essential things. The following method is simple and useful. With any large receptacle to strain into, a hoop is procured that will fit readily over the outside, fasten to a sheet of one inch wire chicken mesh and then throw the strainer cloth over that. This may be filled full with no danger of the cloth ripping or splitting.

When it comes to packages for wholesale, cans are more desirable than kegs or barrels. If the honey granulates, it is easy to liquefy in the can, it may be more easily removed, is more convenient to handle and the jobber can get rid of it more readily.

Every honey producer should have his own label and that a distinctive one. Do not rely on the machine made labels of the supply houses, but if possible have one specially made up so that people once buying honey will recognize the label and ask for this kind again.

If bee-keepers find that they are not successful as salesmen, it will pay to employ a person with some experience to sell their honey and pay a fair percentage for this purpose. Many of the New York bee-keepers are uniting and turning their honey into a central sales agent, who by handling large quantities can afford to ask for a low commission.

In closing, Mr. Miller repeated the advice to keep your own name forward in the markets. If selling direct to the retailer have your honey as fine as you can, keep it uniform in flavor, color and body, so that your name on the label will always be connected with a high quality of honey at a good price

Mr. Sibbald: The subject of marketing honey has received quite a little attention from myself. I have had the opportunity of receiving honey as a wholesaler from bee-keepers all over, and that has given me a good idea of how they sometimes send it in, and it has given me a good idea, too, of how they make mistakes, and how disgusted the wholesale man becomes because things do not turn out just as they seem on the outside. I would urge bee-keepers to put up their product in a uniform package, and be very careful to mark the grade on it, so that they can tell just at a glance from the outside what is going to be found inside. A wholesaler receiving that honey for one or two or three years begins to know, and he does not have

to go right down into every can and test it. It saves him a lot of trouble, and he knows as soon as he receives the invoice for it that the weights will be all right, and the quality just as the man says. He likes to do business with a man like that, and it encourages him to handle honey at a little less margin than if he has to go to the trouble of taking the crate off every can, putting it on the scale and weighing it, and taking off all the lids and testing every can. In shipping to a wholesale man he usually marks each can with a number. That number is the consignment number. It does not matter if the wholesaler does not examine it right away, as soon as ever that can is emptied or shipped he knows whose honey it is; and if there is a kick comes about that honey it comes back according to the consignment number, and there is a mark goes on the book against that man that will hurt him when he comes to sell again. It pays to be particular about these things, and to be honest about them, and to try to do them in a business-like way, so that the wholesaler won't have any more trouble over it than is necessary.

As to the quality of the honey, as Mr. Miller says, we can't always control the source of our bees gathering honey, and the darker colors of honey are not worth as much here as the light honey. The people here want a white honey, especially in Toronto. In Montreal, I believe they can use a darker honey, and that is a better market for it than Toronto. I believe the dark honey is on the increase, and I have heard some of our friends here do not think very much of buckwheat honey, but, when we begin to work with it, and extract it and taste it, and get used to the flavor of it, we don't think it is so bad after all. It seems to me that there is a little field for bee-keepers to educate the people to like dark honey.

What I have said is in reference mostly to extracted honey. Comb honey is a harder thing to buy and to handle, and to come out all right on, than extracted honey. The grading of that is very mysterious, and it looks to me like a very unfair way, often. You will look at the outside, which is splendid, but you will look inside and perhaps there are some cull sections at the back. When a man packs honey like that I have a pretty good idea what sort of a man he is. I don't feel like handling comb honey unless I know pretty well the man that puts it up, and the wholesalers are in that very same position. Bee-keepers ought to improve along that line and grade their honey better. The first comb ought to be a fair index of what is behind.

Mr. Herschiser: I don't think you can blend the real rank honey and get anything that will improve the quality. There is one difficulty I have run up against in marketing honey in and around Buffalo, and that is, that there is quite a tendency on the part of the jobbers to engage in what I call unfair competition. There was a time when the jelly glass was quite a popular package for selling honey, and it is yet, in my section, and there was a time when they used to sell for $1.50 to $1.75 a dozen, but there was a continual effort on the part of the dealers to bear down the price and get it for less—for $1.35 and $1.25, and finally for $1.00; and when it got down so low as that, there was no profit in putting up honey in jelly glasses and selling at that rate. I then selected a smaller glass, and brought them in fifty barrel orders at a time, and I got quite a nice trade in selling honey in jelly glasses that I could sell for a dollar a dozen. About the next year after that, a jobbing house in Detroit, another in Toledo, and some others, put a jelly glass on the market, a dozen of which would hold about three or four ounces of honey less, and they put them down to 85 cents a dozen, and the size being nearly the same as mine it knocked mine out of the market. I have now discontinued the use of the jelly glass. After I sell what I have, I

will go into it again, but I will get the smallest jelly glass I can get for that purpose, because I am quite sure I can produce and sell honey, by employing fair means, cheaper than the jobber, but I have got to meet him on his own ground. I have got to put up a small quantity for a small price.

Mr. DICKENSON: I quite agree with Mr. Miller in regard to a bee-keeper building up a reputation of his own, let it be whatever character of label he may adopt. I think it does not matter what the other fellow does if you put up good goods that will recommend themselves, but you want to be sure you are right every time. I don't know that we could adopt those methods of blending honey here in Toronto that Mr. Miller mentions. The flavor of basswood honey is different from clover honey. Sometimes those honeys are blended by the bees, and we cannot help ourselves unless we are pretty sharp to take off the capped honey in the clover season. I think perhaps each locality or country has to have its own system before blending could be recommended.

Mr. HOLTERMANN: In connection with this subject of "Side Lights on Marketing," there is the method of doing business, where we find a very great variation. The majority of large buyers want to buy delivered. I didn't realize what the difference in selling in the two ways was until I was saddled with a bill for something like $50. If the man sells delivered, the risk is all his until it reaches the warehouse of the buyer, and people who are not in the habit of doing a great deal of business are very apt to not consider the difference there should be in price in the two systems.

There was one point in Mr. Miller's address as to the thickness of honey. As Mr. Dickenson has said, one country perhaps cannot lay down a rule for another, as in the matter of blending, but in this country we have tried to educate ourselves as much as possible in the direction of having our honey as thick as possible, and what we are trying to get out of is selling thin honey. We find here, our customers want a well ripened article, and the better ripened we can have it, as long as it is not at the sacrifice of flavor, and the thicker we can get it, the better our customers like it.

Mr. HERSCHISER: If by some possibility we could control the bee-keeper who has a crop of honey to sell, and cannot wait until it is sold in order to get a fair price, but urges his commission house or jobber to sell at any price, I think it would go a long way towards greatly benefitting all bee-keepers.

Mr. MCEVOY: Mr. Miller speaks of blending honey on the other side. On this side I would rather see each kind kept separate and sold according to its value. The mixing of honey does not go so well in this country.

Mr. TIMBERS: Some gentleman has said that the tendency is drifting to darker honey. What I have had in the last three years has been a little darker shade than what I have been used to, and I find the cry is, "Why don't you bring some of that light honey you used to bring years ago?" Again, Mr. Miller said he did not think the average housekeeper knew the difference; it was sweet and that was all, and they wanted something thin to pour out. I find that is not the case in Toronto. They want something good and thick, and if it is not thick they will very soon call your attention to it. If you take a dozen glases of honey, six of which are nice and bright, and six of which are dark, I don't care if the dark is a little the best flavor and is a little heavier, if you set them on the counter side by side, I am satisfied, in the Toronto market, that the six light glasses will go first every time. That has been and is my experience to-day.

Mr. CHISHOLM: Speaking of marketing honey, I put it up in pound sealers and five and ten pound pails, and I have no difficulty in marketing

all of it. I give the dealers ten per cent. off. I have shipped some to the Northwest for about ten per cent. off the retail price, f.o.b.

Mr. CHRYSLER: I think we can safely blend clover and basswood honey together in this country, but as to other flavors, I think we would be doing something very much against our own interests to blend them. Mr. Miller has said something about the consumer regarding honey as honey, and the uniformity of it is what we want to get at. We might find some honey in some locality of a superior grade. Probably the product of a whole locality would not average 50,000 pounds. If it is good white honey, a good flavor, and a little better than the average, I don't think it would be wise to blend that with our regular clover and basswood honey and make a uniform blend throughout. In regard to marketing in the Northwest, I think they are willing to pay a good price for a good article. They want the best article there, and they have got the money to pay for it.

Mr. COUSE: With reference to marketing, I really believe that Mr. Miller has found the conditions here are different from what they are at his home, and I believe that conditions differ greatly in different districts. Mr. Chrysler has just made reference to the Northwest. I believe if Mr. Chrysler were to go West and produce honey such as they have, he might find that the honey they have produced in the West is what they want as badly as they do ours. I believe in the vicinity of Dauphin there is a great amount of honey produced. I know a grocer there who has bought all the honey he requires for a number of years to sell in the town of Dauphin, and it was all local honey, entirely different from what was got here, but the people there have been educated to the use of the honey produced there. I believe in Mr. Miller's vicinity they have no particular honey that they do produce. We think that is where his trouble is; therefore he can't get it or does not get it unless he brings it from some other source. If we were to go to California I don't doubt but that the California orange honey is just about as good as their sage honey; either of them is excellent; but wherever the sage honey is consumed, that is where they want sage honey; and where they send orange honey, orange honey has the preference.

Mr. MILLER: When I was in California the bee-keepers down there told me they never got any honey from the orange. The bees got pollen from the orange and honey from other flowers. Mr. Hill, in Florida, tells me the bees never get any honey from the orange blossom. While there may be honey in it to attract the bees to it, it never yields any surplus.

Mr. COUSE: It is a fact that they have what they call orange honey.

Mr. MILLER: There is a lot of honey that comes out that is labelled that.

Mr. COUSE: If I were to give an opinion on some honey I got at the Pan-American Exposition that was brought from Chili, I would compare it with orange flavor.

Mr. MILLER: The odor of the orange blossom is very different from the flavor. Our own is more like the jasamine or arbutus.

Mr. COUSE: However, it goes out as that. Take the sage, it is a most beautiful bright honey, and I would say if a person got used to it they would like it very much; it is not strong at all; it is very mild. In reference to people wanting a change, and the different flavors, I really believe that people who are in the habit of getting clover honey do not want anything else. I have customers I have supplied for twenty-five years, and I know they don't want anything else. My idea is this, when you have once created a market for a thing, keep on giving them that one thing.

I believe in the Old Country they fancy the darker honey, such as sage, because they are accustomed to it. I believe in the city of Montreal, where they have been in the habit of getting buckwheat honey, they can sell much darker honeys than in Toronto. Toronto has been educated to use good honey. The matter of exhibiting honey here for thirty years has created a market in Toronto for good honey, and the same with other products.

Mr. ALPAUGH: These two gentlemen that have been last speaking have their doubts about orange honey. Having kept bees in California, right in the orange belt, I have a little idea about it myself. The orange tree is a very good honey producer, but it is like our soft maple, it comes in the spring when the bees are not in shape to get it. As a rule it is the first blossom they get, practically, except a little from the eucalyptus or pepper, which does not amount to anything. The orange is fine honey, but you don't get a surplus from the fact that the bees are not in shape to get a surplus. They use it up in brooding. I have got enough just to taste it, like our soft maple or willow, but you don't get much of it on the market.

As to blending honey. I think that is one of the finest things that there is if people practice it. For years I have blended my honey, and I have found splendid results from it. I never sell pure clover or pure basswood if I can get something to blend with it; it is too bright or suspicious looking. If you can put about one hundred pounds of dandelion honey to a ton of clover you have improved it immensely in every shape and form; you have given it a rich color and it improves the taste of it in my estimation. I have sold that sort of honey in different places here in Toronto and in the Northern markets always with satisfaction. If I can get my honey with a little bit of gold tinge to it, that is the best shape to get it in.

Mr. HOLTERMANN: I would like to ask Mr. Alpaugh whether he does not find that most of the clover honey put upon the market has blend enough in it already?

Mr. ALPAUGH: That is all right if it has. We are not talking about honey that is already blended.

Mr. MILLER: Some time ago I wrote something about mustard honey. It is a brilliant golden honey, and where it has but a small fraction of some of the other honey we do not perhaps always realize that it is not all mustard. If any of you gentlemen want to practice blending honey, do it on a small scale; it is one of the fine arts. If you put buckwheat into another honey it will give a distinctive flavor to it, but don't expect to produce a nice golden honey by putting a little buckwheat to bring down the color of the white honey, because you won't get a good blend. Neither will mustard help you out. In blending your honeys keep them at a temperature of 110 at least, and stir them well together, and then run them through a strainer cloth.

Mr. COUSE: Could you detect the flavor by the smarting sensation of the mustard?

Mr. MILLER: It is an acrid, bitter taste.

Mr. COUSE: You are really satisfied it was mustard?

Mr. MILLER: I know it was because the apiary it came from was down on the shores of Naragansett Bay, and back of the apiary was a large tract of woodland over which the bees did not go at that time, and there was an extensive acreage of oats in which mustard had grown very freely, and the bees were just swarming on that. It was black mustard. The flower is the same as the yellow mustard; it is simply one of the varieties.

Mr. COUSE: I cannot agree with you in this. On one of my apiaries there is a great deal of mustard, and two years ago, when we had practically

no honey at all excepting mustard, it was not bitter at all. The only way I could detect it was by the smartness when you got it on your tongue.

Mr. MILLER: I have had occasion to trace the honey to its source since, and I have found that every time when I came across that taste of honey, there were mustard fields near. Soils make a great difference to honey of course.

Mr. HOLTERMANN: How did you find the color?

Mr. COUSE: Just similar to the dandelion.

Mr. MILLER: Did it make the comb quite yellow?

Mr. COUSE: Yes, everything was decidedly yellow.

Mr. MCEVOY: Did you ever sample it pure?

Mr. COUSE: Well, of course, in a very thin way, from unloading the bees.

Mr. HOLTERMANN: There is a good deal of mustard in the vicinity of Brantford, and I find it a nasty thing to contend with under these circumstances: Where the nights and early mornings are cool, the clover does not yield, but the mustard does yield at that time, and it is in right where the clover is, and in seasons when we have that kind of weather the clover is sure to be spoiled by the mustard. The bees work on the mustard until the atmosphere is warmed up sufficiently for the blossoms of the clover to secrete nectar, and then the bees turn on to the clover. It is sharp tasting and somewhat amber in color, and it certainly does deteriorate the quality of the honey. I never analyzed it as being bitter; that is a new thought to me.

Mr. TIMBERS: I didn't know there were two varieties of wild mustard. I have seen acres and acres of mustard in the Old Country, and the honey gathered from it is as fine and smooth as a man can want. It is reckoned one of the best honeys in England.

Mr. BYER: I believe it was my honor to be the one who had the argument with Mr. Miller in regard to the question of mustard. Mr. Chrysler suggests that we do not all taste alike. We have fields of mustard all around us every year, and the bees work on it every year. Our friend Holtermann says they work in the morning. Never with us; it is right in the extreme heat of the day when the thermometer gets up to about 95. Our honey product is pretty good around home; the bulk of my crop was sold in Toronto this year; it is not as white as we get in the clover sections where they have no mustard, and I noticed a little of that sharpness, but don't think there is any discount on it on that account. This year I believe I got the highest price that was going in a wholesale way. I regard mustard as being all right; some years it yields when the clover doesn't. I have not noticed anything in the line of bitterness as suggested by Mr. Miller or Mr. Alpaugh. It must be all a question of locality, or else we don't taste alike.

Mr. ALPAUGH: I got two thousand pounds one year of what I called pretty near pure mustard, and I must say it was about as bitter as eating mustard out of a jar, and it was strong. Perhaps "bitter" is not the right term, but strong or sharp.

Mr. DICKENSON: I am surprised to find we have so much mustard in this Province. I am fortunate in living in a township where we have no mustard at all. It would almost appear from the remarks of the gentlemen that know that they have got the pure stuff, that it is pretty rank. I don't think it would be advisable to blend that with good clover.

Mr. BROWN: In our section we try to keep the honey separate as much as possible and sell it under its proper name, buckwheat, clover, or basswood, as the case may be.

Mr. LOWEY: I think it is a difference in taste. In my neighborhood the bees work on the clover, and on a neighbor's place there is mustard, so called, that the bees work on, and that honey has a sharp taste. I think, like Mr. Holtermann, in a cold damp season the bees would work on it.

As to the blending of honey, circumstances and localities alter cases. I have had people from both West and East at home where I have had beautiful linden and clover honey, and I have had them declare they never tasted or saw anything like it, and I have had those parties write and say, "Whatever your price, I want honey like that." I don't think we should let the idea go out, especially among beginners, to blend honey when we can get the bees to blend it.

Mr. TIMBERS: That is what Ontario's reputation is built upon, clover and linden honey.

Mr. REED: Can anyone determine the difference between alfalfa and alsike?

Mr. LOWEY: The alfalfa honey is light, and the alsike is inclined to be golden.

Mr. COUSE: If you get pure alsike honey and can it, six months afterwards you can smell an alsike clover field. If it is pure it is just as white as anything you ever saw.

Mr. PETTIT: I happened to have the most alsike honey this year I ever had, and ever so many who have sampled that honey have said it was the nicest honey they ever saw, because it was almost pure alsike honey, water white, and with a peculiarly rich flavor and aroma which you do not get in anything else.

Mr. LOWEY: I am glad to learn alsike is white. It must have been blended by the bees.

Mr. HOLTERMANN: As to alsike, I do believe that where the flows are poor we often find the color is off. It may be because it is gathered from other sources, but not always. The more flowers the bees have to go to to get honey the more they mix it with pollen, and that pollen may color the honey. If you get a heavy flow of alsike, it is white; if it is not so heavy it may not be so white, because it is colored with pollen.

Mr. BROWN: Has anyone found much difference in the quality or flavor of Dutch or white clover and alsike?

Mr. McEVOY: Yes, the finest honey in the world is wild white.

Mr. PETTIT: That difference in color may be a difference in locality again, but we were speaking of alfalfa, and we always used to think that alfalfa would not yield honey east of the Mississippi, but I had some fields of alfalfa near one of my yards, and the bees worked quite thickly on it.

Mr. GEMMELL: There were about twenty acres of alfalfa growing near me a few years ago, and I went around on it particularly and examined it closely, and I could hardly see a bee working on it all the time it was in bloom. That is in the vicinity of Stratford, and it is clay loam soil.

Mr. HOLTERMANN: I have had the opportunity of watching alfalfa for quite a number of years, and I have never said that alfalfa didn't yield. It does yield some, but for those who have only had experience with alfalfa this year, I believe it has yielded more than it has in fifteen years at least.

Mr. GEMMELL: What kind of soil does it need?

Mr. HOLTERMANN: Clay loam.

Mr. LOWEY: Alfalfa winters in my locality, but it will not produce seed. Until the ground becomes inoculated with the germs and draws the nitrogen from the atmosphere I do not believe alfalfa will be a success.

Mr. HOLTERMANN: I did not attribute it to that. In the irrigated sections you have a great deal of moisture in the ground and the atmosphere intensely dry. This year there was a good deal of rain, and in the clay soil it was full of water and the plants were deep, and when this drouth set in the atmosphere was intensely dry, and with the moisture in the ground it produced the condition which is found in the irrigated sections. That is my theory.

Mr. COUSE: I think the alfalfa will produce seed in the vicinity of Toronto.

Mr. BURKE: In regard to alfalfa yielding honey, after the crop had been cut the second time and the clover and alsike was all out of bloom, I got a comb partly filled of almost pure alfalfa. That was in the Niagara District, four years ago.

Mr. HOLMES: We had better adhere to the old plan and follow it, and keep our honeys separate and distinct, and sell them on their merits. That is the plan we have been following. It is the best plan still, unless we can be educated. We are open to conviction. We find instances that come to us as surprises. For instance, the individual who claims that West India molasses is much better and more enjoyable than the finest maple syrup. This to some of us is perhaps a surprise, and yet we have a lot to learn.

Mr. STORER: I had extracted a yard of very nice honey, and the season was fully half over, and I left the combs on just two days too long, because I wasn't there to see to it, and I had to sell that honey at two cents a pound less than the other. That is my experience with blending.

QUESTION DRAWER.

Does sour honey and pollen cause pickled brood?

Mr. TIMBERS: I don't think so. I have fed some to the bees and I have seen no evil effects from it. I believe the greatest cause of pickled brood lies with the queen. If you put a glass over the eggs you will notice that they are dark in color and have the appearance of what we term in hens' eggs, a "soft shell egg." If you change that queen you will find that is where the secret of pickled brood is. I don't think it is from sour honey or pollen.

Mr. HOLTERMANN: Does Mr. Timbers find any special variety of bees more apt to produce that than another?

Mr. TIMBERS: I have been a champion of Carniolans, but I believe they have a tendency to that more than the Italians.

Mr. ARMSTRONG: I have noticed this season that wherever I found pickled brood it was as general thing amongst the black bees. I found very little amongst the Italians.

Mr. TIMBERS: I had a colony this summer pretty bad from that, and I received from Mr. W. S. Hutchinson, in connection with the *Review*, a queen; when she arrived I naturally went to this colony that was the worst, and nipped the queen's head off, and introduced this new Italian queen. While we have often attributed it to the fault of the bees' feeding, the fact is, that these same bees that were in there and had been starving, when I put that new queen in there, every egg that the queen laid hatched and matured properly, and was capped over as perfectly as anyone would want to see, and yet there was nothing else in that hive except the same bees to care for it.

Mr. HOLTERMANN: Don't you think it is possibly a combination of the two?

Mr. TIMBERS: I don't think it. As soon as the eggs were laid by that queen I put in the centre a new comb just for experiment, and the eggs were as white and as plump as could be, whereas you could see the difference in the eggs that the other queen had laid almost with the naked eye.

Mr. MCEVOY: What would you do if you took that queen out and introduced her to another colony that were good feeders, and in that case never saw any more pickled brood?

Mr. TIMBERS: I have never tried that. When I take a queen of that description out I don't bother putting her anywhere else. I may say, at the time this happened we didn't have a flow of honey at all.

Mr. DICKENSON: Was the flow equally as good after you introduced the queen as the other time?

Mr. TIMBERS: Yes, just as good; but it wasn't good at any time.

Mr. BYER: I understand Mr. Timbers to say that with the change of queen the disease would disappear.

Mr. TIMBERS: That is what Mr. Alexander called European Foul Brood. If it is the genuine thing, I don't think it will, but if it is pickled brood, by changing the queen the disease will disappear.

Mr. BYER: Mr. Scott, in Northumberland county, has tried the Alexander system of re-queening, and the disease broke out in every colony, without exception.

Mr. TIMBERS: I had a little chat with Mr. House, and from what Mr. Byer has said, I have come to the conclusion that Mr. Alexander's European Foul Brood was nothing more or less than our pickled brood.

Mr. COUSE: Supposing in a great many colonies you had what you call pickled brood and it disappears shortly with the same queen?

Mr. TIMBERS: That might be from more feed and the queen has got fed up. With the scarcity of feed coming in the bees may have fed the queen less and consequently she has not been able to get the effect.

Mr. COUSE: I never had as much pickled brood as I had this spring, and I never fed as much sour honey, therefore I said, "I guess this is coming from the sour honey," and I kept close watch, and it wasn't long till it all disappeared. How do you account for that?

Mr. TIMBERS: I don't think the sour honey had anything to do with it. I fed sour honey between fruit bloom and clover one summer, and I never had my bees come out better.

Mr. MCEVOY: This pickled brood business is all over Quebec, Ontario, Nova Scotia, and many parts of New York. The season, the neglect of man, and the queen is responsible for it. I have never had any pickled brood in my apiaries, simply because I look closely after them, and see that they have plenty of unsealed stores during the time that they are building up. If I have a queen that won't feed the larvae well, I pinch her head off.

Mr. MILLER: Perhaps I can help the gentleman out here in this matter a little bit. Worchester County, Mass., is fortunate in having a number of members of the faculty of Clark University, trained, scientific observers, actively interested in the study of bees and bee life, and I have been in pretty close touch with them, and we find that beyond reasonable question, queens are often weak constitutionally and productive of weak offspring, just as they are with any other form of animal life, and where you change one of those queens you get rid of your trouble. Then there is the other thing, that is, the matter of nutrition. One man says he feeds sour honey and gets good results; the other man says he feeds it and gets bad results. What is sour honey? If it is one that merely gives you an acid reaction it may not be harmful; the other man's honey tastes sour and perhaps it is

full of yeast ferment. That will be calamitous to the bees, while the first honey will not. In one case the honey is all being turned into alcohol, and in the other you merely have got an acid taste. So, while both of you are talking of sour honey, it is different kinds. Yeasts in honey are almost sure death to the bees, depending something upon the proportion. The presence of a little acid in honey is not harmful to the bees. If the bees get these diseases it is because the systems are weakened and they cannot fight them off. Certain strains of bees are more resistant to certain attacks of disease than others. You have got to see that the bee has something to keep itself going; the two things it needs are hydro carbons and nitrogenous products. If bees have got sufficient heat producing and tissue forming material they can stand a lot of disease.

Mr. NOLAN: It is as yet only in the experimental stages with me. So far as I have used it I think I would just about as soon go back to the old non-reversible factor in comparison with using the reversible, as I would to discard the gasoline engine. The engine I use is a 1 h.p., and weighs about 200 pounds, and I take it around with me to my two out yards. I usually make it a point to have it remain for a day or two at a yard, but if I have to take it away it is only a matter of a few minutes to remove it and take it along with me, and it saves just about a man's time and energy. The engine cost $80. I know on a very warm day it seems an easy matter to do extracting when you only have to uncap the combs and put them in the extractor and take them out; you are not tired when the day is over. In fact, one man can do about as much work as two. The engine is made by the International Harvester Company. There is a cheaper engine made, but I don't think it is quite as good. I use my engine for other light power work.

The PRESIDENT: I have used the gasoline engine for three years to do my extracting, and I have been exceptionally well pleased with it. It will save you all the work of turning, and you all know what that means. You can make it work just as fast as you choose, and it will keep you busy, and you can turn out the work of two men without any difficulty. First, let the engine alone until you understand it. When it does balk, clean the igniter and know that your batteries are right. If your gasoline is not right, sometimes it will fool you in that way. I have a 2 h.p. engine of the International people's make, and the cost is $150.

Mr. NOLAN: I had a crop of 14,000 or 15,000 pounds, and I considered the engine saved me twelve days' work.

Mr. PETTIT: What is the size of your extractor?

Mr. NOLAN: A four frame extractor keeps me busy in extracting.

Mr. PETTIT: Would a 1 h.p. engine be big enough for a six frame extractor?

Mr. NOLAN: Yes, I think for an eight.

Mr. SIBBALD: I was at Mr. Nolan's this summer, and saw his engine at work. I always had an idea that the engine business was hardly adapted to bee work and extracting, and so on, but I was greatly surprised with the way Mr. Nolan was making it succeed. It certainly would save one man on the job, and perhaps extract a little more honey out of the combs, because it runs very steadily and at a good speed.

Mr. ARMSTRONG: You can buy a gasoline engine in Guelph that will do the work for $65.

COMBATTING FOUL BROOD.

By D. Chalmers, Poole.

It is a question if we apiarians are confronted more stubbornly by any subject at the present time that the effective combating of foul brood. We are certainly greatly indebted to Mr. Wm. McEvoy, of Woodburn, Ontario, for devising and giving us a simple course of treatment whereby diseased colonies are easily rid of that dread malady; but back of that we have obstacles of no little magnitude, the greatest and almost the whole trouble being amongst those who keep but a few hives which in many cases might well be placarded "No admittance whether on business or not."

During my short experience as a foul brood inspector, I encountered quite a number of hives containing immovable combs. If they had separate bottom boards the hive was up-ended, and a chunk of comb containing brood cut therefrom in a rude way, through the underside of the hive. You can readily understand that the disease might be present in the hive and yet not be detected by such a test. Then I have been confronted with colonies which could not be diagnosed without the hive being torn asunder, and had to go uninspected. Those are the main obstacles inspectors meet with in their search.

As the Foul Brod Act now reads, inspectors have no power to order bees to be transferred (should the combs be immovable) unless " foul brood is know to exist in the apiary;" and the question arises, how is the inspector to know whether the disease exists or not when there is not a removable comb in the yard? My impression is, that this state of affairs can be remedied by the Minister of Agriculture having the Foul Brood Act so amended as to compel all who keep bees to display to the inspector at least three combs of maturing brood, or all, if requested, from every hive desired, and in the event of failing to do so, empower the inspector to destroy objectionable hives, together with their contents.

Another trouble which looms up before us in combatting foul brood, is the locality question. "The Inspector, whenever so directed by the Minister of Agriculture, is to visit, without unnecessary delay, any locality." Localities in which some keep bees who are very ignorant of the art of bee keeping, and who are not observant enough to detect bee diseases, would assuredly never think of applying for an Inspector, and consequently, from them the disease will eventually work into our locality again. The question arises, could there not be some means instituted of locating every colony of bees in the Province, and have these inspected, where deemed necessary, by the inspectors?

When foul brood is found in the apiary of many of those bee keepers who think bees should look after themselves, the great trouble is to get them to grasp the instructions and act according to the plan directed, which would effect a cure, if carefully carried out. It might truly be said of many of them, "They have ears to hear but hear not, neither do they understand."

Another plan suggests itself which would undoubtedly be more effective in stamping out foul brood, and that would be to have a quarantine station in every township where colonies affected with the disease could be sent for treatment, and have such done by a competent person, the cost of the work to be borne by the owner of the bees. Were this plan carried out, and I hold it could be done at the least cost to the Province, it would be the most effective means of overcoming this, our enemy.

Mr. SIBBALD: The paper makes several original suggestions, one is the quarantine station or hospital for sick bees. That is a new idea. I don't know whether I could endorse that or not. I think the burning stake perhaps would be easier than that, and I don't think it would be wise to move bees with the disease. I have often been struck with the idea that if the assessor for each township would take the number of colonies kept and the address of the bee-keeper, it would help the inspector quite a bit. The cities and towns are the hardest places to find apiaries. You go into a township, and they know everybody, but you go into a city and you get very little help from the bee-keepers there as to who keeps bees. On account of the honey being sold and shipped back and forth into the towns and cities, that is probably why they have so much foul brood. Foul brood is more prevalent there. If the Government could devise some way of having the bee-keepers register and pay a tax, it would be a good thing.

Mr. MCEVOY: I am sorry to contradict Mr. Sibbald, when he says there is more foul brood in towns and cities than in the country, as though the people in the country were very harmless. I think the registration plan would not be a bad one.

Mr. CHRYSLER: As I have been fortunate or unfortunate enough to be an inspector, and the orders I got were to go thoroughly all over the country, and there was no information as to where foul brood existed, consequently I made up my mind I would have to go all over my territory—commence at one place and go thoroughly through. I did find it. Where I have gone I have taken nearly every colony in the locality, and I think I have got every man's name down and the numbers of colonies he keeps. In that way I think we can deal with those men after we once get over the territory. Mr. Chalmers' suggestion of having a quarantine station is a new one. I have one in my mind, I don't know whether it is feasible or not, and that is, that the Province of Ontario should have some school or experimental apiary run on a good large scale, and there should be several of such schools throughout the Province; and where there is an infected district have the bees with foul brood sent direct to that experimental apiary and have good bees sent back in their place. Bee-keepers cannot understand it from reading, as well as if they went to some place and saw the practical work. It would have been a good many hundred dollars in my pocket if I had had such an opportunity years ago.

Mr. BROWN: Mr. Chrysler's last remark is a line I have been thinking along for some time. The Provincial Government is paying a lot of money sending out instructors for the purpose of instructing dairy and cheese workers, and it seems to me it would be a good thing for the members of this association and bee-keepers in general that not only foul brood inspectors be sent out, but capable instructors in bee-keeping; it would be a boon to the bee-keepers of the Province.

Mr. ARMSTRONG: That is what I have been doing ever since I started; I have been instructing not only along the foul brood line but along any line in the bee business.

Mr. GRAINGER: What is being done at Guelph and the other experimental farms along the line of instruction in bee-keeping?

Mr. HODGETTS: We have been looking for a bright young man to run one of these large apiaries which Mr. Chrysler spoke about, but we haven't found him yet. I may say the Government has something of the nature of an experimental apiary in view.

Mr. COUSE: There is not the least doubt that the Department of Agriculture is quite willing to go a long distance in helping us. They have gone

a long distance. The inspectors were sent around by the instructions of the Department of Agriculture to educate bee-keepers wherever they had a local Association. Form your local association and then help yourselves, and you will be helped. By the inspectors going around they are certainly educating the ordinary people to do bee-keeping in a proper way. They are thoroughly experienced men, and in that way impart education wherever they go. What you are asking for now is being done.

Mr. HERSCHISER: I rise to decline the job, but I wish to ask what the laws are in the Province in reference to hogs and cattle that have diseases which are infectious, if when they are infected whether they are put out of the way and the owner compensated for them in any way?

Mr. HOLTERMANN: They are compensated.

Mr. HERSCHISER: Why shouldn't the bee-keeper be compensated for the loss of his bees from disease when it is necessary to destroy them? I should think that would be the best way to do away with any friction between the inspectors and owners of bees.

Mr. HOLTERMANN: The Infectious Disease Act and its enforcement comes under the Dominion Government. To carry out things to a logical conclusion, bees should also be dealt with under the Dominion Government, but they were not, and the Province took it up, and it has been in that position ever since. As far as compensation goes, I think it applies to only certain kinds of disease, or an uncertain percentage.

Mr. MCEVOY: It would never do to have them pay for diseased bees to destroy them; it would be a cheap way to sell out. Bee diseases are curable, and it would only open the door. That question was up eighteen years ago.

Mr. CHRYSLER: If a colony of bees should be destroyed they are practically of no value, because the next spring they would be dead anyway and would be a danger to all the rest. I can see no loss to the bee-keepers by destroying it.

Mr. REED: Mr. Chalmers suggested in his paper to have a law enacted to have the persons remove the combs themselves. Isn't that law in the Statute now that nobody can keep bees in boxes without movable frames, so that the combs are movable and easily inspected?

Mr. BYER: I believe the law reads something like this, that when the insepector is sure of foul brood in that apiary, then he may order the bees to be transferred to movable frames.

Mr. REED: I always understood it was an illegal act to keep bees in any hives that hadn't movable frames.

Mr. GEMMELL: At the time the bill was drafted by the late Mr. Fraser that was discussed, and we thought it would be almost impossible to go through an apiary and inspect it properly where they had combs in box hives.

Mr. CHALMERS: The Act reads "movable frame hives," not "movable combs." I was in a good many apiaries this summer where they were all movable frame hives at one time, but since the bees got into them there were none of them movable. By this paper I meant movable frames.

Mr. LOWEY: I visited with one of the inspectors this summer three yards; two of them were supposed to be composed of movable frame hives; the combs were built in every direction, and the top of the hive nailed down tight. The inspector had to get on top of the hive, while I pushed from underneath. We examined three hives out of eighteen and found them clean. The next place we called there was literally a box hive. The man said he didn't know anything about bees, he only kept them for fertilization

of his fruit bloom. From what I have seen from visiting yards it is quite an undertaking to educate some men to become bee-keepers. I have shown them how to put sections in supers, and in ten minutes they would be going on in the same old way.

Mr. Newton: In answer to Mr. Dickenson's question as regards box hives and frames that are not removable, one might be surprised, and I have been surprised myself during the past season, at the number of people that have hives where it is impossible to move the frame from them. In one locality I could find far more that could not get a frame from the hive than those that could. In one yard alone I think there were pretty near fifty hives that had not a removable frame in the whole yard, and that man has always kept them that way. If disease ever broke out in a yard like that then the inspector would certainly have his hands full to get rid of it.

THE PRODUCTION OF EXTRACTED HONEY.

By Alex. Dickson, Lancaster.

What is extracted honey? All bee-keepers know perfectly well the source of honey. Instinct has taught the busy bee to know how to build up its combs, and in those combs to deposit the nectar it gleans from the flowers. After the ripening process is over, the bees cap the honey over and it is known as comb honey. To obtain extracted honey from this, the cappings are removed and the combs placed in an extractor where the honey is thrown out of the combs by means of centrifugal force. Our product now is extracted honey, for which there is a great demand in the market. The only or main thing being to produce the good article. If all present here at this association were old hands at the business, it would not even be necessary to write on such a subject as extracted honey, but granting that some beginners are present, I will direct my remarks to them particularly. In a plentiful year the apiarist finds no difficulty in producing a quantity, but he must not forget that it is quality that is needed on the market, the ripe product only being acceptable.

Every keeper of bees has his or her own way of working their colonies, and, by the way, locality has everything to do in this direction, for a method that might hold good in one place might not suit at all in another. If you wish to produce a good crop next season, providing the season be a good one, you must commence the fall before, first by seeing that all your old or slow laying queens are replaced by young ones, and second by watching carefully that your lower combs are not filled up with honey and crowding out your queen too early. If these things are not attended to what will be the consequence? Your colony will be put in winter quarters far short of the bees it should have, and when spring comes you will find that you will have a lot of weak colonies. You say, "How am I to avoid this?" Quite simply. Remove the outside combs, which are full of honey, and replace with empties put in the centre. Your young queen is thus given a chance to do her best before the closing of the laying season, and you will find when the time for fall feeding comes that your colonies are flowing over with young bees. A colony should have at least 25 lbs. of honey to winter on, so be sure to feed up all colonies having less.

The combs you have taken out to give the queen a chance to lay, you will put away till feeding time, and then you can give them back as winter stores. One of the secrets in procuring a large crop is to have good queens. My own experience for the past twenty-five years has been that the best results were obtained from a colony that was put out in the spring with a young queen of the previous summer. But remember, all young queens are not a success. I know some apiarists who make a practice of re-queening every hive yearly. But I would not advise that either, for I have had queens laying at the age of three years that could not be beat.

Now, for the spring. When you put out your bees, always make a practice of putting them out at night, as it avoids mixing up the next day. But make sure you have a fine day. Help the bees to clean their bottom boards by replacing with a clean board. In about a week see that all colonies have a laying queen; if not, double up. Make sure they are not short of stores, if they are, feed them. Build up your colonies for all you are worth till clover begins. Stimulate if necessary. Now your bees are in prime condition to roll in the honey. Put your combs on in good time, and don't let them get the swarming fever.

As the first set is filled tier up, and as each store gets capped over, take off by means of the bee escape. My plan of using the escape is to put it on in the afternoon, and in the morning you are ready to begin extracting. Don't allow your bees to get idle for want of room. Keep them at work. As for your extracting room, it should be bee-proof, and everything about it clean and tidy. In my honey room I use tanks to store away the honey so that you can fill your tins at leisure. I am quite aware that some won't have tanks at all, but fill their tins from the extractor. As for myself I have no use for such nonsense. It is certainly a loss of time if you are extracting from 600 to 1,000 pounds a day.

In putting up your honey for market in whatever form it may be called for, make it as attractive as possible.

Much more might be said on the above subject, such as cleaning combs at end of season, preserving empties not in use, fall preparation, feeding, and how to feed and various other things, but time does not permit. In conclusion I might say that one cannot go by any cast-iron rule, but must proceed a good deal on his own good judgment.

Mr. McEvoy: I would like to draw the line at the age of those queens. We don't want it to go abroad that that system is a good one. The young queens are the most profitable.

Mr. Lowey: The paper states, "put your escapes on in the evening and the next afternoon you are ready to extract. In my experience I think that would be a little wrong. The honey would cool, unless the nights were warmer than they are in my section.

Mr. Nolan: I think the paper leads us to understand that we use bee escapes at all seasons of the year. I won't agree with that point. I think there are seasons in the main honey flow when we do not need to follow with the escape. Escapes are valuable to take off honey at the close of the white harvest flow when you are rushed for time, or you can use them for the purposes of preventing robbing.

QUESTION DRAWER.

Q.—To what extent can the use of honey be increased, and by what means?

Mr. TIMBERS: I don't know to what extent it could be increased, but I know in the neighborhood where I live—I moved there eight years ago—and for a number of years before I went there, one hundred pounds a year would have supplied all the surrounding district. Before I had been there three years I averaged one thousand pounds to two thousand pounds a year, sold right at the house. That was done simply by bringing it to their notice. I started by hitching up a horse and peddling, but during the last few years I haven't had any to peddle. I always gave them a good thing; and if you do this they will come back. Another way would be, if the local Agricultural Society would give honey the same consideration that they give other products. I have received this year quite a number of prize lists from different Associations. At Peterboro I find $6 is all that is given for prizes for honey and wax, whereas for preserves alone there is somewhere about $18 given, and for poultry there is something over $100, and other things in proportion. At Seymour Fair I find $2.50 given for honey, while something over $70 is given for fruit and other things. Then in West Hastings, Stirling, Warkworth, Scarboro, there is no prize at all; and Oshawa has $3 for honey and wax. I have put up an exhibit at Scarboro for the last ten years, and I find it pays me even though I don't get a prize. It seems to me that there must be something lacking, that honey, one of the best products of our Province, should be so lightly represented at all our fairs. I think some of the Government grant might be well spent in educating the public in this line. Even when we do get prizes it is pretty hard to get a judge.

Q.—Can the people in the Western Provinces be educated to eat buckwheat honey?

Mr. TIMBERS: Does a man need an education to eat what he likes? If a man in the Western Provinces likes it, he will eat it; if he doesn't, I don't think you can educate him to eat it here or there.

Mr. HERSCHISER: I don't know whether I differ from the gentleman or not, but I do know people's taste can be cultivated to eat certain things. I know, for instance, in the eastern part of New York State, where buckwheat honey is produced, it has a greater consumption than where it is not produced. I have an apiary near Welland, Ontario, where there is a good deal of buckwheat honey produced, and frequently people come to me and prefer the buckwheat. I give them the same price on both the white and the buckwheat, and I remember one time I was there for three or four days, and I sold about 300 pounds of honey, and half of it was buckwheat.

Mr. TIMBERS: I live in a buckwheat district; I think I have got a thousand pounds a year, and I find it is no use trying to shove it on to a person that does not like it.

Mr. HERSCHISER: I wouldn't want to be misunderstood in trying to persuade people to take what they don't like, but, if they want buckwheat, let them have it.

Mr. DICKINSON: I think there is such a thing as cultivating a taste for these things. We have instances of that in other things besides honey. With regard to buckwheat honey, you may cultivate a taste for it. Take for instance tomatoes. Sometimes they are not particularly liked at first, but

after eating them for a little while and persisting, people think they are the finest fruit that there is. It is possible we might do that with buckwheat honey. I am very fond of it.

Mr. TIMBERS: If anybody knows how it can be done, let us know.

Mr. CHRYSLER: I think it can be done. I have done a little in that line this year. I had occasion to exhibit at our fall fair, and I had some samples of dark honey, and I said, "Here is some that is dark, and I will sell it to you cheap or give you a sample; if you like it, all right." I offered it for eight cents a pound. Give the people a sample and they will take it. Those samples I have given them have been taken home and tasted, and the neighbors allowed to taste it, and as a result I have sold hundreds of pounds of that honey, and I am selling more all the time. The children like it, and the parents get used to it.

Mr. HOLTERMANN: The question I think is based somewhat on a misconception. I would infer from the question that the people in the Northwest do not want buckwheat honey. In the Northwest the people are coming from all parts of the world, and from our own Province, and there is just as great a diversity of taste for honey there as here, so that I think there are people there now ready to take buckwheat honey if they can get it. You can acquire a taste for buckwheat honey, and I am satisfied you can educate the people to want it. The trouble is to get hold of someone to handle it in the West. On the other hand, we want to be careful not to force it on people out there who are not likely to be able to sell it; so that it will have to be introduced in small quantities.

Mr. LOWEY: I educated my people this fall to eat buckwheat, and they were glad to get it. I have no trouble in getting ten cents for buckwheat honey. Buckwheat honey is as good as clover honey with certain people. Some people have spoken of buckwheat honey as bad honey; it is not.

Mr. CHISHOLM: I have had no trouble in getting rid of my buckwheat honey at ten cents a pound. I am sending out buckwheat honey, and it is giving good satisfaction. I generally have nearly as much buckwheat as I do clover honey, and it is not bad honey if you have it nice.

Mr. HERSCHISER: I am a little surprised to hear bee-keepers speak of buckwheat honey as a poor quality of honey. I think bee-keepers ought to recognize the fact that buckwheat honey is a good honey. Bee-keepers are not all the same. When I was at the Detroit Convention there was a bee-keeper in Wisconsin, Mr. Moe, who ordered a can of buckwheat honey to be sent out there to him because he was acquainted with it in the East, and he said he wanted some of it. I think bee-keepers ought to recognize the fact, and not convey the idea to your customers that buckwheat honey is inferior. It is not. The fact that some of these gentlemen are getting ten cents for it is pretty good evidence that a lot of people like it, and more would, if it were not for bee-keepers giving the idea that it is a poor quality.

Mr. HOLMES: I think Mr. Herschiser is perfectly right in his contention that we have not given buckwheat honey a proper chance. Our customers have come in and looked at our honey, and we have said, "Oh, this is only buckwheat honey, we are not offering that." As to natural taste and taste acquired, look at the immense trade that is done in tobacco, which people actually eat; they hang their banners on the outer wall and say, "Chew this and that brand." Show me the individual who liked it at first. (Laughter.) You say it is a vitiated taste. I say, "No, it is a taste acquired, not a natural taste." I am not wishing to compare our choice buckwheat

honey with tobacco, but I am only wishing to show we can cultivate a taste for things.

Mr. COUSE: Men who are in the habit of raising buckwheat honey can sell it. It is the same with cheese. If you get into a German district where they are used to having Limberger cheese, they will consume it; if you get into a Canadian cheese district, they are used to that, and that is what they want.

Mr. SIBBALD: The growth of buckwheat in the Province of Ontario, I think, is on the increase. I noticed the acreage is increasing in many localities I have visited this summer. They claim it will clean the land. Our land is getting dirty because of the change of system in farming, and the farmers must resort to some means in order to clean the land. I think the price of buckwheat honey has been better this last few years than it used to be, so that I look to see a good deal more buckwheat grown, and more buckwheat honey produced in Ontario than we have had. I think it would be well for bee-keepers to consider putting buckwheat honey before the people.

We have Mr. House and Mr. Clarke from New York State with us. They have given me a hint about buckwheat, but I don't intend to use their ideas. I will let you call them and let them give their own ideas.

Mr. HOUSE: I might offer a suggestion in regard to educating people in the use of buckwheat honey. It improves by age. By allowing it to stand for one season and then introducing it in localities where they are not acquainted with the flavor or taste, you have no difficulty; that is for table use. It loses that strong flavor, and is much milder in taste and aroma both. It is a delicious article, and not inferior to the white honey. Certainly we can cultivate the taste.

Mr. CHRYSLER: Do you advise putting it in unsealed or sealed packages?

Mr. HOUSE: That which I have used myself has been in 60 pound kegs.

Mr. HOLTERMANN: Do you think if it could be sold granulated that you could educate the people to use it that way much more readily than in liquid form?

Mr. HOUSE: A very strong part of the buckwheat aroma has passed off after it has become granulated. The longer you allow it to stand the better; but do not put it on the market too early.

Mr. PETTIT: My experience is that buckwheat has a good many other things mixed in with it this year; consequently it has a much milder flavor.

Mr. GRAINGER: I believe the question is, how can we educate the people to like buckwheat honey? The general public at exhibitions come along and look at buckwheat honey, and the majority of them do not know what it is. They want to know what that black stuff is; there is a good deal of prejudice against the color. I have had some experience with selling honey in the city to people who use it for medicinal purposes, and as a general thing they won't take buckwheat honey at all. I have been asked to mix it in that way, and they will use it. Some people I find crazy over it. This year in one case I had to send buckwheat honey away to the States, to Nebraska. Let the people taste it; put it before them as much as possible, and an exhibition is an excellent way to show people what buckwheat honey is.

Mr. TRINDER: I don't think there is any trouble about buckwheat honey; I have sold pretty nearly nine hundred pounds right at home. I took some up to Simcoe to a certain gentleman. He tasted it, and said, "I don't want any more of your light honey; I am going to buy dark honey." I can sell mine for eight cents at home, and never take it from the house,

and I can only get ten cents for the light honey. I have got pretty near as much again of the buckwheat honey as of the other, and it is no trouble to get rid of it. It is no trouble to sell the buckwheat when people get used to it.

The PRESIDENT: Mr. Clarke, of Doolittle & Clarke, of New York State, is with us, and, coming from a buckwheat district, we will be pleased to hear from him.

Mr. CLARKE: My forte is not speaking, for I have been married some twenty years. On the subject of buckwheat honey I don't know that I can add much to what has been said, except that this last year I had about 500 pounds and sent it to New York and I got fourteen cents a pound for it; it sold more readily than the other. I can remember when buckwheat honey was much cheaper. I think people are getting so that they like it better. My wife says she wants the dark honey, because there is bottom to it. I prefer it to the white honey after it has stood a year, as Mr. House has said.

As one gentleman has remarked, it is practically the color that is against it, and that is what has kept it back. Pretty nearly everything that is sold that is edible is sold on the color. I think why you people are so prejudiced against it, as you seem to be, is because you have not had so much of it as we have in New York State. Perhaps if you had been brought up on it you would like it just as well as you do the white.

Q.—Would it pay a bee-keeper to market his honey personally in the West in preference to selling in Ontario?

Mr. CHISHOLM: I ship honey West every season. This year I have sent my white honey West for 11 cents, and they pay for the cans besides, and pay their own freight. I get nine cents for the buckwheat honey I am sending West, and as soon as I get a trade up to suit me in the Northwest I expect to start marketing my product there. I have been getting ten cents for buckwheat and a York shilling for my basswood and clover. My honey is all extracted honey.

ADDRESS OF WELCOME.

By J. D. EVANS, ISLINGTON.

I think I owe the ladies and gentlemen present an apology for not being here last night. I believe I was on the programme for last night, but the fact of the matter is, I had been judging honey all day. I want to welcome you here, and I hope you will make it a point to come here every year. I am sure the county council would be disappointed if you went anywhere else. I had particular orders from the Warden to say to you not to leave any bees in the hall, because the county council are meeting in a short time and they might get bees in their bonnets. I told them that the atmosphere of sweetness you would leave behind you would keep the council in good humor when they met. Every year I rejoice about the time of the meeting of this convention, because I have so many old friends, and I regret also the absence of so many. When I was first a member of the Association my old friend Jones was one of the chief honey producers in Canada. Then there are a long succession who are not here: My friend Hall is not here to-day, nor M. Pettit; and there are a great many others who have disappeared. But I am glad to see the younger men are rising in their places and taking the place of those dropping out, and I am sure this Association will go on and

prosper. Bee-keeping is in a better, sounder and more satisfactory condition than it ever was before in Canada. I think we owe a great deal to the various governments from whom we have asked favors in the shape of legislation, and a great deal of legislation has been passed that has helped us in a great many ways.

I wish you every success. I won't detain you because you have important matters to discuss, and I know you will discuss them in that beautiful manner which is peculiar to bee-keepers.

REPORTS OF APIARY INSPECTORS.

Report of J. L. Byer.

As you doubtless are aware, most of the appointments were made late in the season this year, and it was impossible to take up any regular line of work—that is, to make any thorough inspection—and the result is I went only on special calls where I was sent by the Department. I put in about twenty days; of that eight days were spent in Northumberland County. I visited some fifty apiaries in the Counties of York, Durham, and Ontario, and I found only nine apiaries with genuine foul brood. Out in Northumberland County there were eight yards that I found black brood in. According to what appeared in the *Bee Journal*, Mr. Anguish seemed to think there was not as much as I said. I wish to say that with us here to-day is Mr. Chisholm, of Wallbridge, and I believe he will back up what I have said with emphasis. Mr. House thinks I have not made it quite strong enough. In black brood we have a very serious menace to the industry in Canada. Mr. House told me he regarded ordinary foul brood as simply nothing as compared with black brood. I am not trying to exaggerate, but, on the other hand, I don't think we should minimize. If that outbreak of black brood is not stamped out some of the would-be scoffers will be sorry. In Northumberland County they hardly know what to do with it.

Report of Wm. McEvoy.

During the past season I inspected 63 apiaries, and several of these I inspected the second time. I found dead brood in every apiary, and in many apiaries I found a great deal of dead brood in every colony. I was astonished at the mistakes that were made and the reports that were sent to the papers. When will bee-keepers learn to tell the different kinds of dead brood in every stage and one from the other.

I did not find much of the real foul brood, but I found large quantities of starved brood. This class of dead brood was found in very many localities in the Province of Ontario.

Tests proved to me that the honey to become diseased must be first started in cells where foul brood matter had dried down. When the bees began storing pretty fast, I took the combs out of a number of diseased colonies, and shook the bees back into the same hives, and then put in empty frames and left the bees to build their own combs. The bees soon made a little comb, and then stored part of the honey they took with them from the diseased combs, and after that foul brood broke out again in the colonies that had been the worst with the disease, After that I took away the little combs made during the first four days, and left the bees to build more combs.

This made a sure cure in every case. I saved the brood that I took from the diseased colonies, and tiered it up on the weakest, and when the most of it was hatched I treated these colonies. When the honey season was drawing to a close I found a few cells of foul brood in several colonies that were full of good brood. I worried a good deal over this, because I saw that it was going to be pretty late to get curing done by comb building in the fall when the brood was all hatched, even if I could get suitable weather to feed sugar syrup while the bees were building comb. And on the other hand, I also saw that if I destroyed all this brood that I would have nothing left but the old bees to go into the fall and winter with, and that the most of these bees would "peter out" with old age before spring. I saw that I had to have all this brood hatched so as to get plenty of young bees to go into the winter quarters with. I also saw that I had to get all these colonies cured before winter. Now, how was this to be successfully done, and have all colonies brought into spring in good condition?

After some more study I thought of another plan and that was to feed the sound colonies abundance of sugar syrup and by so doing get the bees to fill and seal every cell in the outside combs right down to the bottom, a thing they did do. When this was done, I took these outside combs out, which were full of all capped stores, and saved them until an evening in October when the brood was all hatched out of the combs in the diseased colonies. I then took the combs out of the diseased colonies, shook the bees off them and put in the sound combs of all capped stores, and these not having any place in them for the bees to store the diseased honey which they took out of the old combs, the bees had to consume it. This made perfect cures in every case, and these colonies that were given the all capped stores came into spring the best of any of my apiary. These methods of treatment which I cured all my colonies by in 1875 were all of my own working out, and I never got any instructions from anyone.

This pickled brood that is spoken of is starved brood, but it will take some time to get bee-keepers to come to that. If they will Italianize every colony that they have got and look closely after them from fruit bloom to the beginning of clover, or during any check caused by rain storms or anything, they will be able to over come this, because when the bees send up a certain quantity of brood if they do not get enough food to follow it up the brood will starve. You will find in some of them that about the ninth day the brood is lying on its back; it is coiled up quite sharp, and that brood has got a skin on that has decayed from the inside, and you can lift that out. Foul brood goes to decay from the outside, but this from the inside, which are two distinct things. Then some of that brood was capped over that did not get quite enough honey to last it through, and it died, and then the cell was punctured, and the bees find it punctured. The books are telling about punctured brood being dead brood, and they say, "He has got foul brood sure." It is not foul brood. Some of the brood will cut the capping off, and it had not strength enough in the jaws to cut a clean, round cap. There is a difference in the kind of bees. It would never do for me to advocate Italians the way I do if I was a breeder.

Last spring and the spring before were two of the poorest springs we have had in many years for bees. They failed to get the supplies to follow up, and we had pickled brood, as they called it, here and there all through. That was starved brood. In a spring like this it takes about a pound to go around for each colony, and then you watch for the results a day or two after. Bee-keepers do not pay enough attention to the care of bees between

fruit bloom and clover; at every little check in the weather it stops. This black brood, after all, is a pretty bad thing, but I have a letter from Mr. Wright, of New York State, to show that it can be cured, and profitably cured. I will read you Mr. Wright's letter. (Reads letter). I read this to show you that even in those bad cases it can be cured and turned to good account afterwards.

Report of Wm. Armstrong.

As Inspector of the counties of Norfolk, Oxford, Waterloo, and Wellington, I inspected 150 apiaries and found foul brood in sixty-two, making about 41 per cent. of the apiaries diseased. The percentage last year was 50 per cent., but the reason of the lower percentage this year was owing to my going over a great part of the same ground this year to see if the bee-keepers had cleaned up. I found that they had with only a few exceptions. The total number of colonies inspected was 2,583. The total number diseased colonies being 260, making about 10 per cent. of the colonies diseased.

I might say just here that the 150 apiaries inspected does not show the amount of work connected with that many apiaries, for I made from two to four visits to each yard where I found foul brood. I find that the bee industry is very much improved since last year. The bee-keepers seem to have some life in them now, but last year they did not seem to care which way it went. Now a great many want to buy more bees and go into it stronger.

The winter losses were light last year in our district, the heaviest losses were in the spring where the bees were wintered in the cellars. The white honey crop was good in the clover belt, and would probably average 75 pounds. The buckwheat crop was light. Bees are going into winter quarters in fine shape where they have been looked after.

There is one thing I think should be done, that is, every colony of bees coming into the country should be inspected as soon as possible after they arrive at their destination. I think also there should be something done about honey coming into this country for I believe that is one of the ways foul brood germs are being brought in, for as soon as the barrels and tins are empty they are thrown into the back yards for our bees to clean up and thereby carry the disease to the apiary. It looks that way to me, for I know of several cities and towns where foul brood is prevalent, and I think that this is how the disease originated. I think the inspectors should meet once a year and have one session say the forenoon before the Ontario meeting opens and compare notes and try and find out the best way to wipe out foul brood with the least loss to the bee-keepers.

For the life of me I cannot see how it is we hear so much about dead brood. I must say that I have only found two colonies that were very much reduced by dead brood in bees in the two seasons that I have been inspector. I might say further that I have only found two cases where bee-keepers sent for me thinking they had foul brood, which turned out only dead brood, but all others were the genuine foul brood.

Report of H. G. Sibbald.

In the year 1908 I visited 67 apiaries containing in all about 2,866 colonies and found 44 clean or free from the disease of foul brood. In the other 23 apiaries I found 116 colonies affected with the disease. Only two of these were destroyed, the 114 being treated with a view to curing.

Of the apiaries diseased in 1907 and re-visited, many had made a splendid cure, while a few had failed or more cases had developed in their apiaries. As a rule I found the owners willing and anxious to cure, but want of experience and in some cases other irons in the fire and carelessness were the cause of failure.

Report of John Newton.

As Inspector for the counties of Middlesex and Elgin, I beg to report as follows: The season was well advanced before the appointment was made, July 15th, 1908. In most places where I found the disease of foul brood, it was there unknown to the bee-keeper. So many bee-keepers in a small way are not familiar with the disease and through spreading brood and moving combs from hive to hive soon have the disease in the whole apiary. That is the way the inspector finds it in many cases.

I found the towns and cities and surroundings worse than the country. I lay this to the honey from diseased apiaries being marketed there, and empty vessels thrown out for the bees to clean up and carry the disease home. Then there is the habit of putting out combs and cappings to be cleaned up by the bees. This should be avoided by the bee-keepers. I have found trouble in people buying bees that were diseased and they did not know it. I should like to impress on all buying bees not to do so until they had been inspected by an inspector and pronounced free from disease.

Again, I should like to warn bee-keepers regarding buying queens and introducing them in same cage which they came in. You have a chance to get the disease in your yard. I had under my care the past season one case. The queens had been imported and introduced in the same cages. Those three hives had signs of disease, while no other hives in the yard did. I found some had made a failure of a cure by placing one whole comb in the hive, while treating, thus placing the dreaded germ back into the colony they were treating. Moving bees that are diseased to clean localities should be stopped. No bees should be moved until they are thoroughly cured. I always try to impress on the bee-keepers the importance of knowing the disease at first glance and always be on the lookout for it. I feel sure if we could but only educate the bee-keepers to know it, we would be doing good work.

Inspectors and their work ought to be encouraged among the bee-keepers, as it is very important in our pursuit in life, and the Government is taking so much interest in our work.

Apiaries inspected, 137; colonies under inspection, 5,705; disease found in 28 yards.

Mr. Timbers: In reference to the matter of queen cages, I think the queen breeders should tear off their instructions. They say, "Introduce in this cage."

Mr. Newton: We can't control that, but we should not go by the instructions.

Mr. Timbers: I think queen breeders who send such queens should be exposed.

Mr. Holtermann: Mr. Newton is quite right about that, but I don't see any harm in the statement being made that in such and such an apiary the colonies were all clean, with the exception of three colonies in which three queens were put which were got from so and so.

Mr. NEWTON: You can't do that. I have tried to impress on bee-keepers to know the disease at the first glance. Moving bees again that were diseased into clean localities has been a thing that has come before my notice during the past year. This had been done before I came into office. It is one of the things we should strictly guard against. We don't want a hospital. We want the bees cured where they are and thoroughly clean before they are moved.

Mr. ANGUISH: There was a yard brought into my district, and I understood they were foul brood bees before they were sent. I wrote the Department about it, and they replied that those bees were not to be moved until inspected and cleaned up.

Mr. NEWTON: Since the inspectors have been called off the work there have been reports from several parts where I have no doubt the yards would amount to in the neighborhood of 35 or 40, mostly in Middlesex county, where the disease is existing at the present time. A good many of them have been under the treatment, but I can't tell you till next spring in what shape they are. I hope next year the work may be put on a little earlier in the season.

Mr. ATKINSON: I understand you are inspector for Middlesex. What instructions do you receive from the Department?

Mr. NEWTON: To examine everything as I go along. The man that has one or two colonies I would sooner go to see than the man that has fifty.

Mr. ATKINSON: Do all the inspectors have the same instructions?

Mr. NEWTON: They have had this last year.

REPORT OF D. CHALMERS.

On July 9th, intelligence reached me of my appointment as foul brood inspector for the counties of Huron and Perth. Accompanying this a few names of applicants for inspector's services, suggesting at the same time that I should advise those parties in advance of the date of my proposed visit. I accordingly acted as advised and started on my work July 13th, St. Mary's and vicinity being the first point of contact.

My next trip was in a westerly direction in Blanshard township, as far as the county of Middlesex, some five miles. We visited five apiaries in our trip, and found foul brood in three of the five. I was accidentally taken into the county of Oxford to Mr. Fergus McMaster's, who has a large apiary, a man with 63 years' experience with bees, and yet but few of his colonies could be gone through.

I was called to Centralia, Huron county, and had the liberty of inspecting where the applicant wanted, that was in Clandeboye, and Lucan, county of Middlesex. I didn't find any American foul brood, nor yet any run in the European plan, but in Clandeboye, I found what I could almost take to be a foul brood nursery.

My services were applied for in Stephen township, Huron county, where nearly three days were spent visiting apiaries, and am pleased to report that not a single case of foul brood was found.

Foul brood still lingers in the city of Stratford, it being found in three yards out of seven visited, and the gentleman who piloted me around didn't think there was any before we started on our mission.

I might just say that foul brood has been in my neighborhood at least 17 years, and is there yet.

In all I inspected 53 apiaries, found foul brood in 15, leaving 38 in which none was detected. This was done at a total cost of $95.20.

Report of Wm. Chrysler.

I might say when I got the appointment it was rather late in the season to do very much, but it was at a time when I could treat the disease, if I could find it, right away. I got instructions from the Department to go where I thought best, and to cover the territory thoroughly, which I did. I went to three or four places where I thought it might be, and failed to find it. My next course was to begin at one end of my district and go all the way through. The very first or second day I found seven cases out of the eleven which I visited. It was getting late then, the honey flow was over, but it could have been treated if the bee-keepers could have done a certain amount of feeding for the winter. One man decided to destroy his six colonies of bees which were in box hives, and all had the disease but one or two, and the neighbor's bees were robbing those one or two out. Another man had all of his colonies diseased, but he wanted bees very badly, and he went to work and treated the disease right there, and he got along very nicely. I found foul brood in two other localities besides that. I found eleven yards altogether affected with foul brood. I visited altogether 92 bee yards. By taking them right straight through it was easier to visit a greater number of yards. There were 2,345 colonies in the localities that I visited. I was out somewhere about 28 days altogether. Bee-keepers seem to desire to get all the information they can out of the inspectors, and I have been pleased to give that information, and I think it has helped them and they have seemed to appreciate it. I have gone over nearly half the territory assigned to me. I do not know whether there is any more foul brood in my section of the country, but I suspect that there is.

Report of A. W. Burke.

This year the appointments were made somewhat late, but from the inspection I made I want to say that disease is not nearly so prevalent in the east as it is in the west. The bee-keepers I found in my district were all willing to co-operate with the inspector and do all they could. Nearly all the bee-keepers I went to were anxious to have their yards inspected. I think there is still more room for inspectors in the east. The east is so large that one man cannot go through it and do justice to it. I found disease in four yards; one yard was very bad with it, and the disease had spread from that yard to two others. Then over a hundred miles from that place I found the disease in another yard, but I do not know how it got there. I think if a colony can be saved it should be saved every time, but sometimes if a yard is badly diseased you have got to unite two or three colonies together to save them. I know in the county of Glengarry where they have a local Association, they were more anxious about it than in other parts where they have no Association. One thing I would advise is to clip the queens every spring, and by that means if you go through every hive in the yard, if there is any foul brood you will stop it before it gets the start of you.

BROODS.

By S. D. House, Camillus, N.Y.

During the discussion upon foul brood, I have heard one or two questions in regard to the difference of foul brood and the naming of it, and I believe that all diseased brood is foul brood. As a matter of fact in distinguishing the different stages of the disease, so that we would have a way of recogniz-

ing it or calling it by some given name, our bee papers have called it American Foul Brood, European Foul Brood, Pickled Brood, and some of it Starved Brood. They are all foul after they are dead. What I shall say mostly is in regard to the European Foul Brood or Black Brood. As I said a year ago, I thought it was in your Province here, and, as I understand now, it has appeared. I think it has spread far more than you believe at the present time. I will try to give you some idea of the working of the disease, speaking from the view point of one who has had five hundred cases of it himself, and has dealt with it himself. In the first place, American Foul Brood is very tame beside the European in the way of virulence. I bought 98 colonies of bees last fall; in November I moved them into the cellar, and at that time I had not discovered that there was any disease whatever. In moving them out of the cellar a few of them had raised brood in the cellar and had already shown the disease. In May, I had 24 colonies left out of the 98. So you see it is something that moves very rapidly, and those 24 colonies were not even then working colonies. My idea in saying anything, whatever, to you was to give the bee-keepers in Ontario an idea of how they could discover the disease themselves without the help of the inspector. You will first find European Foul Brood in queen cups with royal jelly, and again you will find it in drone cup; you will also find it in the larvæ from the fifth to eighth day, and the larva first instead of being pearly white and lying coiled in the bottom of the cell will begin to straighten out and double up, and throw its head up, acting as though in distress, and if you look closely at this time about midway of the larva you will find a brownish spot, very faint at first and more distinct later. It soon straightens out and dies and flattens down at the lower side of the cell. At this time, the bees can remove that larva, but after lying there it gathers moisture so that it is almost impossible for the bees to carry it out. If a larva should live until it is sealed, it becomes a black rotten mass before the bees unseal it. Then you will discover a pin hole in the cell or a sunken cell turned brownish. If the larva has come forward far enough to touch the capping, it will show a brownish streak in the bottom. The Italians will remove their own dead larvæ, and with them you are not so apt to discover it in the larvæ stage. Your pickled brood is only an advance agent of the European Foul Brood, and wherever I have seen European Foul Brood, I have found pickled brood the year before, and they all belong to the same family, and I think come from similar sources. The pickled brood has been found more in the larvæ stage after it is sealed. You very seldom find pickled brood dead until the larva has become of that age that it has straightened out in the cell. I don't know that I ever saw pickled larvæ die, while still in the young age, curling up in the cell.

Mr. SIBBALD: Did you ever find what you call pickled brood dead in the queen cell?

Mr. HOUSE: No, I never did.

Mr. HOLTERMANN: The outward conditions are the same but the cause is different.

Mr. HOUSE: Yes. I think they are all relative to each other, only a different stage.

Mr. SIBBALD: Would you describe pickled brood as you see it in the cell, describe what it is like as it dies first?

Mr. HOUSE: The only difference is a brown spot at the centre at the time of larvæ is taken sick.

Mr. SIBBALD: I don't claim to have ever seen this European or black brood, but I have seen pickled brood.

Mr. House: As much as I have seen and handled of it I would be unable to tell you the difference between pickled brood larvæ that is dead and black brood larvæ unless I see larvæ at the brown or yellow stage; that will distinguish the difference between the black and pickled brood.

Mr. Sibbald: As near as I could describe the pickled brood, the larva dies the same way, stretches out similar to what you describe as European foul brood. The pickled brood turns yellow at the point, and then the skin or covering of the larvæ seems to dry hard, and it retains its form in a sense, only it dries away until it is a skeleton. A touch will send it out of the cell. The bees will clean it out. It does not decompose; it holds its form.

Mr. House: I have had a colony with pickled brood recover very rapildy during the honey flow, but with black brood it is different. They will recover somewhat in the honey flow if they have only got it lightly. From the 1st to the 10th July this disease is at its greatest height. The second hatch is about the worst. My experience has been varied. Our inspectors have had a time wrestling with it in New York; they have been at sea part of the time; they started out by guesswork, and had a sure cure, double shaking, melting the combs and burning frames, and either boiling or burning the hives out. It is all right for those that are specially careful, but European foul brood can be cured much easier than American foul brood. It is, however, much faster in its work. There is a preventive, I am using it to-day as a cure, and pay no attention whatever to the disease, and that is, yellow queens.

Mr. Pettit: How are Carniolans?

Mr. House: They are better than the native blacks. They are not as good as Italians. I will not say that the Italians were so immune from disease that it did not appear in the hive, for during the period when the disease was the strongest I could take an Italian and show you here and there a diseased larvæ.

Mr. Sibbald: There is more loss through poor queens than through winter losses or any other kind of loss. Now, there is one thing I have observed, that the Italian race does not seem to stay; if they are allowed to run the business themselves and raise their own queens, the blacks will soon predominate. I would like to ask you if that has been your experience, and why that is?

Mr. House: That certainly has been my experience, to my sorrow. I found in 1884 I had an entire yard of Cyprians, and they were all thoroughbreds from imported mothers, and in four years' time I don't think I had a thoroughbred Cyprian queen in my apiaries, and still I was struggling to keep them pure.

Mr. Timbers: Don't you think Cyprians would fight the disease as well as Italians?

Mr. House: I do.

Mr. McEvoy: But they would fight you, too.

Mr. House: I would rather drop several hundred dollars than be forced to Cyprianize throughout with the yellow bee.

Mr. Dickenson: Do you find the Italian bee does not take hold of the American foul brood in the same manner?

Mr. House: Since 1868 I have not had American foul brood. The only difference between American and European foul brood in its appearance is that ropiness when you undertake to remove it.

Mr. Dickenson: It would appear then that this ropy foul brood is the only foul brood there is.

Mr. House: All our inspectors are doing now is going around and putting in yellow blood, and therefore they are sure of a cure.

Mr. Chrysler: When you speak of yellow bees do you mean Italian or yelllow bees as I have known them? I have been buying yellow bees and queens for a number of years, and I have been buying queens again not quite so yellow, and they are the only bees or queens I care much about. I never bought a yellow queen that produced yellow bees that were worth five cents to me, and I have bought from a great many dealers in the United States. This last season I got some good queens; they are not as yellow as I expected.

Mr. Timbers: My experience has been identical with that of Mr. Chrysler's.

Mr. Armstrong: What is the odor of the different kinds of foul brood?

Mr. House: European foul brood, in the lighter case of it, when one-third of the brood is diseased, has no perceptible odor in opening the hive, but as the colony has become thoroughly diseased then you can get an odor, but no such odor as you get from American foul brood.

Mr. McEvoy: I agree with what Mr. House says a good deal, but bees being yellow does not always make them good ones; but, take the majority of them, yellow queens, well bred, are the best.

Mr. House: At different seasons of the year there are two ways to make a success of it. If you discover the disease before the honey flow, shake, by all means; if the disease is discovered along in the fall of the year, or immediately after the honey flow, de-queen; do not re-queen for 25 days. Buy a queen cell, and by the time the queen cell hatches out and gets to laying, the bees have cleaned and polished up this comb.

ADULTERATION OF HONEY.

By A. McGill, Chief Analyst, Inland Revenue Dept., Ottawa.

It would be a very easy and satisfactory thing to speak in general terms of honey and the character of honey, its history, how it is used, and so on; but this morning I wish to take up the subject in a serious fashion, and while I shall attempt to discard as far as possible all technical terms in the course of this address, yet there are two or three words that will insist upon being used, and just at the beginning I shall ask you to be kind enough to fix in your minds these two or three terms. Take the term "flour." You have corn flour and buckwheat flour, as well as wheat flour. I want you to learn to think of the word "sugar" in the same way. When you buy a dollar's worth of sugar you imagine a particular kind of sugar. You must not imagine that that is the only kind of sugar. What you call sugar I will call cane sugar; I mean the kind we buy in the grocery shops and use in our tea. Chemists call it sucrose. The sugar that is in honey is not cane sugar, at least, not the main sugar. A well made honey by healthy bees very seldom contains more than two per cent. of cane sugar. The sweetness of honey is due to a different kind of sugar altogether; it is really due to two kinds, dextrose and levulose. Often they are put together and spoken of as if they were one sugar; often we speak of this as invert sugar. They are spoken of as invert sugar, because cane sugar can be turned into dextrose and levulose, and to turn it into such is called inverting it. To turn the common sugar we buy in the shops into sugars we find in honey is termed

inversion, and when we do *vice versa* we call it invert sugar. The first thing necessary to a clear and useful discussion of any question is that we should know what we are talking about. In the present case, we must make up our minds as to what honey is. Perhaps you will allow me to illustrate at once the exact definition, and the importance of such definition, by reference to another article of food.

Milk is universally recognized as a product of the cow's udder. We may imitate milk, by incorporating more or less successfully, the fat, milksugar, albumen, casein and water with traces of salts; but without the agency of the cow our best attempts will be denied recognition as more than imitations of milk. But we have still to decide whether the actual product of the cow's udder is necessarily milk. So far as Toronto is concerned, even this will not be recognized a *legal milk* if it fall below 3.0 per cent. in fat. Many cows yield a fluid containing less than 3.0 per cent. of fat; hence these cows do not give milk, or at least do not give legal milk, within the municipality of Toronto. Other cows give a product containing as much as 5 or 6 per cent. of fat. Of course this is legal milk; but suppose I take this milk and deprive it of from 1.5 to 2.5 of fat, is the product milk? You have other constants than fat in your legal definition of milk, and if my dilution with water has reduced the non-fatty solids below the standard 9 per cent., the result will not be recognized as legal milk, but so long as I exercise proper judgment in the addition of water, the resultant liquid will be *milk* in the legal sense of that term, and even should I reduce the non-fat solids below 9 per cent., may I not add such quantity of these as shall bring them up to the legal minimum and thus produce legal milk? Finally, may I not effect dilution of a milk rich in fat, by addition of fully skimmed milk, and thus produce a legal milk? So far as the standards for legal milk are based upon the chemical composition of milk, the supposed treatments yield an article which stands the test for legal milk, and we must recognize it as such. But, if the definition of milk involves the condition that milk is the unaltered and unchanged product of the cow's udder, these manufactured milks cannot be regarded as genuine milk. They may be *as good as milk*, but they are not milk.

I need not further discuss the case of milk, and have dwelt so far upon it in order to give us a sort of analogue of the case of honey. Just as the cow is essential to the production of milk, so is the bee essential to the production of honey, and I think we may decide at once that even should the chemist be able to manufacture something as good as honey (and this does not assume that he can do so), yet would the resultant, lacking the agency of the bee, not be entitled to be called honey.

But again, we have seen that not everything yielded by the udder of the cow is entitled to be called milk, in the legal acceptance of the term. Must we recognize everything that passes through the honey-stomach of the bee and filled by that insect into the comb as honey? Unfortunately we have in Canada no legal definition of honey such as to enable us to describe the article inclusively and exclusively. Sec. 30 of the Adulteration Act R.S. 1906, forbids the feeding of bees with sugar, glucose, or any sweet substance "other than such as bees gather from natural sources, with the intent that the same shall be used by the bees in making honey."

This is the only point upon which we have any legal statement in the matter of honey. Section 30 of the Act further forbids the manufacture or sale of any "imitation honey, or sugar honey so-called, or other substitutes for honey" in Canada, but I shall consider this point later. You will see

that it is assumed throughout that we know what honey is, and we wish now to keep your attention upon the single point "What is honey?"

The law goes no further than to say that honey must be made by bees; and must be made by them from "natural sources." You will note that it is forbidden to supply bees with any other raw material for the making of honey than "such as bees gather from natural sources." When a field of clover or of buckwheat is sown by a bee-keeper with intent to pasture his bees upon it, he is evidently supplying them with a legitimate material for honey production. No one will deny that from the nectar of clover blossoms the bee is capable of making typical honey. Now the nectar of clover flowers has been carefully analyzed and found to consist essentially of about 0.5 per cent. of mineral matters, 85 per cent. of water, minute traces of aromatic substances, and sugars. The sugars constitute about 14 or 15 per cent. of the whole, and consist of cane sugar and reducing sugars (Dextrose and levulose) in the ratio of about 1 to 3; that is, nearly one-fourth of the sugar in clover nectar is cane sugar, the same kind of sugar that we use at the table. We should have such a positive definition of honey, as shall clearly exclude an article made by bees from any other than the actual nectar of flowers. It is not enough to say what honey is not; we must seek to define it positively. This requires a statement to the effect that honey must be made by bees from the nectar of flowers, and it seems to me that we have already arrived at two positive statements which must enter into our definitions, viz.:—

1. Honey is made by bees.

2. Honey is made by bees from the nectar of flowers.

Careful observation has proved that bees obtain material for honey making from other sources than floral nectar. Many plant juices contain sugar in solution. This is particularly true of sorghum, sugar cane, Indian corn, maple sap, etc. These plants, when wounded, or broken, exude a sweet juice which is eagerly sought by the bees. Perhaps more important is the so-called *Honey Dew*, a sweet liquid exuded by the leaves of many plants, particularly such as are affected by aphides or plant lice. The maple, poplar, birch, mountain ash, and some plants of the cress family, are specially noted as producing honey dew. Cone bearing trees provide, in some cases, a raw material for honey making quite different from ordinary nectar, and the resultant honey often has a strong dextro-rotation, whereas honey is always lœo-rotatory. It is apparent that such natural materials as are referred to must be included in our definition of honey, and our second term may now read:—"Honey is made by bees from the nectar and saccharine exudations of plants."

The next point to be investigated is this: "What does the bee do to the raw material in making this into honey?"

Perhaps the most notable change produced by the work of the bee is the concentration of the sugar solution on which it works. Nectars contain from 70 to 85 per cent. of water. Honey-dew from the pine, contains about 55 per cent. of water. The average water content of 138 samples of honey listed by Konig is 20.60 per cent. One hundred samples of genuine honeys exhibited at the St. Louis Exposition in 1903, were analyzed at Washington, and gave an average of 17.59 per cent. water, with a range of from 12.42 to 26.88 per cent. The average moisture content of honey may safely be taken as about 20 per cent. If honey be taken from uncapped combs it may contain decidedly higher moisture, as has been pointed out by Mr. Shutt of the Experimental Farms at Ottawa (1902 Rep. p. 163), and is apparently considered by the bees themselves as unripe. The definition

of honey adopted by the Department of Agriculture at Washington fixes 25 per cent. as a maximum amount of water permissible in legal honey.

On looking over the record of our work upon honey, covering the last 2 years, I find that 730 samples have been examined. These are reported as follows:—

Bulletin	Date	Total samples	Samples containing above 25 per cent. of water
47	1897	183	47
90	1903	99	10
122	1906	54	5
145	1908	253	31
148	1908	141	19
		730	112

It will be seen that about 15 per cent. of all honeys examined contain above 25 per cent. of water. Many of these samples are adulterated, either by the intentional addition of water, or by the use of glucose or any other adulterant. But there remains, when due allowance is made for such samples, a small percentage of genuine honeys, carrying more than 25 per cent. moisture.

I cannot therefore feel quite sure that in the light of present knowledge of Canadian honey, it would be just to establish a standard of 25 per cent. water. Undoubtedly any samples showing more than 25 per cent. must be regarded as exceptional, but that is a different thing from condemning them as adulterated.

Very few samples are reported as containing more than 30 per cent. of water; and most of these are contained in the collections of 1897 and 1903. As noted in Bulletin 47, we had not then decided upon a fixed mode of working in water estimations, and the differing methods employed by different analysts, introduced some uncertainty into a comparison of results. Bearing this in mind, I am of opinion that a limit of 30 per cent. of water may safely be fixed as a maximum amount permissible in genuine honey. If this be conceded, we are in a position to add a third term to our definition of honey.

Honey must be (1) made by bees (2) from the nectar and saccharine exudations of plants, (3) and must contain not more than 30 per cent. of water.

The second point of change brought about in the raw material of honey, by the operation of the bee, is the conversion of the cane sugar (*i.e.*, ordinary sugar, as found in the sap of the sugar cane, the beet, the maple tree, and in floral nectar) into two other sugars known as dextrose and levulose. This change is easily brought about by laboratory methods, and we usually speak of the resultant mixture of dextrose and levulose as invert sugar. The process of making this change is known as inversion. The extent to which the bee effects this change is well illustrated by the following example. Bonnier (Scientific Am. Suppt. Aug. 10, 1907, p. 92) found the nectar of a leguminous plant to contain 57.2 per cent. of cane sugar and 42.8 per cent. of invert sugar. After the same nectar had been converted into honey by the bee, it was found to contain only 8.2 per cent. of cane sugar; *i.e.*, 85 per cent. of the cane sugar had been converted.

On hundred samples of honey exhibited at St. Louis in 1903, were after analyzed at Washington, and the results are published in Bulletin No. 110 of the Bureau of Chemistry. These are representative of most of the States of the Union, and the following summaries for invert sugar are noteworthy and interesting:—

37	samples of	Leguminosae	honeys	averaged.....	76.11
8	"	Composite	"	"	74.84
4	"	Rosaceae	"	"	73.85
6	"	Basswood	"	"	75.14
2	"	Buckwheat	"	"	76.85
99	"	Various sources	"	"	74.41

Very numerous analyses of European honeys confirm these averages for invert sugar, showing that honey contains an average of about 75 per cent. of invert sugar with variations from 65 to 80 per cent.

Under certain not fully understood conditions, bees fail to cause complete inversion of the cane sugar in their raw material. It is pretty well established that if the bees have access to molasses and cane sugar syrup, the resultant honey will contain a higher percentage of unchanged cane sugar than when they obtain their raw material from flowers only. The average amount of the cane sugar found in the one hundred samples of American honeys already referred to was 1.9 per cent, and varied from none to 10.01 per cent. But Lippmann gives the analyses of a honey gathered by bees in the neighborhood of a sugar refinery, which contained 16.38 per cent. of cane sugar. The average for 138 samples of European honey listed by Konig is 1.6 per cent. cane sugar with extremes of 0.00 to 12.91 per cent.

I think it is quite evident that we may now further amplify our definition of honey by mention of a minimum of invert sugar and a maximum of cane sugar. It could be only a very exceptional genuine honey which would show less than 65 per cent. of invert sugar, but to be on the safe side, we may agree to place the minimum at 60 per cent. As to cane sugar, the legal definition fixed by the U. S. Congress in June, 1906, requires that cane sugar shall not exceed 8 per cent. This would certainly condemn some of the genuine honeys displayed at St. Louis, to say nothing of a few European honeys of guaranteed purity, which contained 12 per cent. cane sugar.

So far as the work of the laboratory of the Inland Revenue Department is concerned, no sample of Canadian honey of guaranteed purity has ever been found to contain as much as 10 per cent. of cane sugar. A few samples of probable purity have yielded 10.35 per cent., but we have no assurance that these were not made by bees that had access to sugar syrup as honey making material. I am quite convinced that no honest apiarian will suffer if 10 per cent. of cane sugar be legalized as a maximum permissible in honey. If my suggestions be admitted, our definition of honey will now read: : Honey must be (1) made by bees; (2) from the nectar and saccharine exudation of plants, (3) and must contain not more than 30 per cent. of water; (4) nor more than 10 per cent. of cane sugar (sucrose); (5) nor less than 60 per cent. of invert sugar.

The legal definition of honey for the United States, already referred to, takes cognizance of the mineral matter contained in honey. These appear as the ash in the analytical results. Legal definitions in Germany also take note of the ash content of honeys. I find, however, such conflicting evidence regarding the ash of certified honeys, that I am not able to come to any conclusion in the matter. Honey known to be genuine has been found

to yield only 0.05 per cent. of ash. The limit fixed for the United States is 0.25 per cent., or five times this amount. The German standard is 0.1 per cent. It is easily apparent that a honey exposed to dust might take up sufficient mineral matter *as an impurity* to enable it to pass as genuine so far as a minimum of ash is concerned. For the present, at least, I am unable to advise the connection of ash as a means of judging the genuineness of honey.

Formic acid is always present in genuine honey, and as this acid is not present in the nectar of flowers, or in the other natural juices of plants, it must be introduced by the agency of the bee; but how, is unknown. The well recognized preservative property of formic acid suggests that its introduction by the bee is intended to give keeping quality to the honey. Other acids are also present in honey, particularly malic acid, and the result is that all honey has an acid reaction. But the total acidity of fresh honey is very small. Expressed in terms of formic acid, it amounts to from three-hundredths of one per cent. to nearly one-quarter of one per cent. Its great variation in amount, and the intrinsic difficulties of determination of formic acid, make it impossible to utilize this component of honey as a practical means of judging its genuineness.

Finally, honey always contains pollen grains, characteristic of the flowers which furnish the nectar. Work done upon the honeys exhibited at St. Louis showed the number of pollen grains per gramme to vary from about 200 to as many as 5,000. The largest numbers seem to be found in honeys from leguminosæ, and from the basswood; but there appears to be no constancy in this regard, as certain leguminous honeys showed only a few hundreds of grains per gramme. The principal use of examination for pollen lies in the discovery of entire absence of pollen, characteristic of artificial honey, or in the presence of large numbers of pollen grains of the grass family (gramminiæ) suggesting that the hay loft has been drawn upon to furnish them.

There remains to be mentioned those odoriferous principles, or compound ethers, which give the flowers their fragrance, and to the honey made from them its characteristic odors and taste. In quantity these are too minute to permit of estimation, or even their identification in practicable samples of honey. Yet they are the ingredients upon which the real value of honey depends. Honey is a food, having real and important value as such. And yet it is not upon the mere food value, *i.e.*, nutritive value of honey that its importance as a marketable product chiefly depends. It is upon the peculiar flavor and attractiveness to the palate that its real value is based. Honey is not exceptional in this regard. Wines, fruits, cheese, and many other fruit stuffs might be named which are like honey in this respect. Cheese commands from 10 cents to 50 cents or more per pound, not because of the higher priced article possessing greater nutritive value than the cheaper, but because of certain qualities of flavor belonging to it. The highest priced wines are frequently of no more nutritive value than the cheaper ones. Tea at 25 cents a pound is, so far as approximate composition is concerned, quite as good as that which commands $3 or $4 per pound.

Honey is a food and a valuable one. But it has condimental value as well, and its distinctive character depends rather on the second than on the first consideration. This is a good reason for insisting that nothing shall be offered or sold as honey which is not truly honey. But I conceive that it is not a good reason for interfering with the manufacture and sale of artificial substitutes for honey, so long as these are wholesome food products, and are sold for what they really are.

Section 30 of the Adulteration Act contains these words: "No imitation of honey, or sugar honey so-called, or other substitute for honey shall be manufactured or produced for sale, or sold, or offered for sale in Canada." This is the law, and it is clearly the duty of all of us to see that it is carried out.

Glucose syrup is marked by a decided percentage of a gummy substance known as dextrin, or British gum, which enables it to be identified if used as a honey material, and apart from this fact, it consists mainly of dextrose, while invert sugar consists of dextrose and levulose in equal amounts. Bees feed very unwillingly upon glucose, and cannot long survive an exclusive glucose diet.

The main adulteration of honey takes place in the honey separated from the comb, so-called strained honey. With strained honey, it becomes possible to make additions directly. The most evident method of adulteration is the addition of water. It is for this reason that a maximum limit for water is needed in the legal definition. Under ordinary conditions of temperature, the bee finds honey workable with about 16 to 20 per cent. of water. We have seen that in certain cases a somewhat higher content may be present, but with much above 20 per cent. the honey does not keep well, being apt to ferment. It is safe to say that when water above 30 per cent. is found, this has been added for fraudulent purposes.

Other adulteration of honey are *gelatinized starch*, *glucose syrup*, *cane sugar syrup*, and *invert sugar syrup*. Gelatinized starch, is only interesting as matter of history, being seldom or never employed at the present time. It is too unlike honey to be satisfactory for purposes of fraud, and too easily detected by simple chemical methods, as by the blue reaction of iodine. The lack of sweetness can be made up by addition of a very small quantity of saccharine. Glucose syrup is a cheap material, very closely resembles honey in appearance, has a certain degree of sweetness (about half that of cane sugar syrup) and has, for these reasons, been very largely employed to adulterate strained honey. It is claimed that its use actually improves certain grades of honey, as by making lighter the color of the very dark honeys, and by reducing the too marked flavor of certain strong flavored natural honeys—golden rod, buckwheat, sumac, etc. Most natural honeys granulate on standing, and glucose prevents granulation.

The dextrin present in glucose syrup serves for its easy detection with iodine, and the small amounts of dextrin found in some geuine honeys does not seriously interfere with the reaction, or it may be precipitated by alcohol, preferably methyl alcohol.

Quantitative estimates of glucose syrup can only be made approximately exact; since the article as occurring in commerce is not of constant composition. The methods of working are too complex to admit of presentation here; and they involve the use of apparatus of very delicate construction. In certain products of starch inversion, known as grape sugar or commercial dextrose, the dextrines, on which we depend for the detection of commercial glucose syrup, may be quite absent. If a syrup of this character be used, the product will be strongly dextro-rotatory, and when examined at a temperature (87 deg. C.) at which levulose is optically inactive, the change in the reading will be less than if levulose had been present in such proportion as it should be in genuine honey. By this lowering of the difference in the readings at 20 degrees and 87 degrees, the presence of added dextrose is manifested.

Cane Sugar Syrup. We are compelled to fix from 8 to 10 per cent. of cane sugar as permissible in honey, because a few natural honeys are found

to contain this amount. But the great majority of genuine honeys contain less than 2 per cent. of sucrose, and it therefore becomes possible for honey packers to add about 8 per cent. of cane sugar to honey without any danger of being accused of adulteration. It is, for this reason, much to be regretted that exceptional honeys show ten per cent. cane sugar. Perhaps it may be possible to improve some varieties of the honey bee so as to insure their ability to carry the inversion of naturally occurring cane sugar to completeness. In that case, the honey made by such variety of bee would command a high price, as it could be guaranteed free from added sugar. At the present prices of honey, I believe that the use of cane sugar syrup as raw material from which the bee may make honey is unprofitable. Hence, when we find excess of cane sugar in honey, we infer that it has been added by the manufacturer direct, and not through the agency of the bee. In some cases an acknowledgement of such addition is made (See No. 28,627 of Bulletin 122) but usually it is necessary to resort to chemical analysis to discover the fraud.

Fortunately the detection and approximate estimation of added cane sugar is not difficult. The methods and apparatus are, however, too complex and delicate to permit of their being successfully used outside of the laboratory. A glance at the columns of any of our bulletins will show you how frequently honey is adulterated by the use of cane sugar syrup. The adulteration which is most difficult of detection, because of its practicable identity with the sugars of honeys, is invert sugar. The manufacture of so-called "sugar-honey" or (Kunst-Konig) is a well established industry in Germany, and is not unknown in other countries. Inversion of cane sugar is usually effected in this industry by the addition of minute amounts of tartaric acid, the quantity employed being so small that resultant acidity is scarcely greater than is characteristic of true honey. Prolonged heating is necessary in order to bring about a fairly complete inversion under these conditions, and it is partly because of this fact that we are able to discriminate between the invert sugar of genuine honey and the manufactured article. The levulose component of the invert sugar is partly destroyed at the high temperature needed for inversion, and there results a slight deficiency of this sugar as compared with the dextrose. But the difference is too small to furnish a safe guard to the analyst. In short, no trustworthy evidence of adulteration with invert sugar can be obtained from examination of the sugars contained in honey. We are therefore driven to depend upon delicate tests which may serve to detect minute traces of substances which are present in commercial invert sugar, but not in honey.

Mr. McGill then submitted a resolution regarding the legal description of honey, which will be found, as adopted, on page 63.

Mr. HOLTERMANN: I would suggest that this resolution which Mr. McGill has presented to the Association be handed over to the Committee on Resolutions. In regard to the legal percentage of water to be allowed, in the United States their definition is twenty-five per cent. I happen to know that the recommendation of the Apiarian Department at Washington was twenty per cent., which Mr. McGill says is about the average per centage of water in honey, but in order to give abundant room for any difference there might be in a good quality of honey the Department of Chemistry, with Dr. Wiley at the head, decided to make that twenty-five per cent.; so I think we certainly would be making a mistake if we were to fix any lower standard for Canadian honey than they have in the United States. I have felt ever since they have raised their standard, and they are now ahead of us in this respect, that it is necessary for Canada to take

steps in order to keep up with them. If we are going to develop the bee-keeping industry and seek for markets in foreign lands, then everything we have in which we can show the consumer we have safeguards in our own country that will tend to give us a pure article and an article of good quality, will help us in that foreign market.

For my part I feel the Department of Inland Revenue can do a very great deal to help us in having a good and pure quality of honey produced in our own country; and also can help us in keeping from coming into this country adulterated articles in connection with honey and other goods. For my part I would very strongly say, let us have it 25 per cent. instead of 30 per cent.

Mr. Evans: I would like to ask Mr. McGill a question. I noticed in Bulletin 148 there were 141 samples of honey tested and three found doubtful and two adulterated. Now, I see by the report in the press last night that Mr. McGill declares that throughout the Province there is a large quantity of adulterated honey being sold. I would like to know if he is correctly reported.

Mr. McGill: In answering that question I would say in the first place I cannot hold myself responsible literally for the statements of reporters, so that unless there is a statement over my signature to the effect that a large amount of adulterated honey is sold, I certainly refuse to be held responsible for it. Any substitute for honey is adulterated honey. In a strict sense from a legal point of view this article labelled "Honey-suckle drips" is an adulterated article, and is being sold very extensively.

Mr. Evans: As a matter of fact I doubt very much whether that is being sold very extensively in this Province.

Mr. Alpaugh: Can you give us any information as to why some honeys will granulate and others will not?

Mr. McGill: The granulation is caused by the crystallizing out of the dextrose. If a single crystal of dextrose forms, a hundred others very soon form.

Mr. Holtermann: With reference to section 30 of the Adulteration Act, I have been waiting for someone to answer Mr. McGill's question on this point. That brings us back to some of the by-gone days when we had that subject up. From what Mr. McGill has said, he seems to think that perhaps it is a little unfair not to allow its production and labelling where it is done. With a man in the important position that Mr. McGill occupies it seems to me it is our duty to give him our view of the matter. A law is always the greatest good to the greatest number, and in that there may be some apparent injustice but that is the line upon which law is based, and when the oleomargarine law was passed it increased the confidence of those in foreign lands in our product, and it helped this country immensely in increasing the imports of dairy products. When you come to the bee-keeping industry, all that can be said about oleomargarine can be applied to that, and more. We, as bee-keepers, feel that wherever our industry is increased that honey is in one sense only the by-product; that an object ahead of the production of honey is in the nature of assisting in the fertilization of blossoms; and every intelligent bee-keeper feels where he is planting an apiary he is benefiting those in the neighborhood in connection with clover seed, buckwheat, fruit growing and so on. It is on that basis I believe we have an added claim that everything shall be done which will help to foster and increase the bee-keeping industry, and where we prevent the sale and production of that kind of article we are encouraging an industry, the source of which

is these blossoms, and in the gathering of which this great benefit is being done to everyone in the neighborhood. There is such an intimate relationship between the production of one and the other that it would lead to confusion even by honest people, and would throw the gates open to a great many who are not honest; and it would be a very difficult task and would require a very large staff to see, as it could only be done by chemical analysis, that one was not done for the other. It is for that reason that I, and bee-keepers at large I believe, feel that that law should remain upon the Statute books of the country.

Mr. HERSCHISER: I would like to add a word or two to what Mr. Holtermann has said. I think his counsel is very wise. On the face of it it does seem as though what Mr. McGill has said in reference to the fairness of allowing manufacturers to manufacture what the public want to buy and label it what it is, is correct; but that sample on the table shows to us what people are disposed to do with their products; they are an imitation of something else; they want to sneak them in, and by that label to make the people believe it is honey when it is not. You cannot trust these people. They want to steal the good name of honey to put it upon the adulterated article. If they would not do that we might have a little more sympathy for them.

The PRESIDENT: The resolution as drafted by Mr. McGill will be handed over to the Committee on Resolutions. They want to steal some name that has a good reputation among people in order to have their spurious articles put upon the market, so I believe in giving them just as little leeway as possible.

MEASURES TO PREVENT SWARMING.

By OREL L. HERSCHISER, BUFFALO, N. Y.

The natural tendency to swarm during the main honey flow occasions more trouble and annoyance to the bee-keeper than all other apicultural duties combined during the season of honey production. Much has been thought and written on the subject of non-swarming hives, non-swarming strains of bees, swarm hivers and the like, the common aim being to diminish the work during swarming time without diminishing the maximum amount of honey obtainable by the best management and, by reason of swarm control, to enable the keeping of out-apiaries and thus greatly increase the honey output.

That out-apiaries may be successfully managed for extracted honey without troublesome swarming many of us know, though I freely confess that I annually lose a few swarms. While greater vigilance might prevent the losing of any swarms, I aim to conduct my apicultural operations on such lines as will produce a maximum profit with a minimum expense, and for extracted honey production I am satisfied with the result. I fancy the majority of bee-keepers who run out-apiaries for extracted honey are also satisfied with their success.

With me the control of swarming in the production of extracted honey is successfully accomplished by enlarging the brood chamber from time to time as needed by adding what I have found by experience will be not just enough, but an abundance, of room for the queen, and at the opening of the honey harvest an abundance of room for the storage of the honey. At

the near approach of the swarming season too much room is just enough. But with very prolific queens, and especially when a visit to the out-apiary has been delayed by rainy weather or for other reasons when the weather conditions are conducive to swarming, it occasionally happens that a few colonies will become overcrowded, and hence the loss of an occasional swarm. But inasmuch as the lost swarms represent a smaller sum than would be required to keep an attendant in charge, or to compensate for the upsetting of plans in order to reach the out-apiary on exact time, the lost swarms with me do not represent an actual loss of profits.

The control of swarming in the production of comb honey in out-apiaries is quite a different proposition. This has proven to be a will-o'-the-wisp that many of us have been chasing with greater or less fervor, but thus far it seems to have eluded our every effort to grasp it. De-queening and breaking down queen cells eight days thereafter will certainly accomplish the desired end, but the compensation in comb honey produced over that of extracted honey is not enough to more than equal the expense of the additional labor. Going over all the colonies of an apiary that are at all likely to swarm during the next eight days, once in eight days, examining every brood comb for queen cells, is open to the same objection. In the arid regions of the West, where apiarian work may be planned with precision without interruption on account of rainy spells, this last-mentioned plan may be more economically and successfully followed than elsewhere where weather conditions interfere.

I believe it has been claimed that a swarm will not issue from a hive containing two or more queens, but I believe many bee-keepers will agree with me that we need first to know how, with precision and little labor and expense, we may be able to supply and have our colonies accept two or more queens before we will be able to determine whether that plan is successful when extensively applied.

Separating the brood combs by division racks, and allowing an abundance of room for clustering in spaces at the ends of the frames as well as between each two combs, is claimed to be a means of defeating swarming. While we have not tried this means of preventing swarming, we have no reason to doubt that it will succeed, if for no other reason, we would assume, than that the breaking up and leaving the colony in what might be termed an abnormal condition might cause them to neglect swarming preparations that would naturally obtain with colonies in the normal conditions. However, if, as is claimed, more honey may be produced from a given number of bees; in other words, if it pays, there is no objection to the plan on the score of throwing a colony out of the normal state. The expense of making the change of hives would naturally suggest itself, but the logical conclusion on that point would naturally follow the determination of the query, "Will it pay in dollars and cents?" Before making a wholesale change of outfit the apiarist with hundreds and thousands of dollars invested in hives will naturally ask himself whether the extra help required to separate all the frames of brood of all his colonies in the spring, and assembling them again in the fall, would not be much or more expense than would be required to keep an attendant in each yard during the swarming season, whose odd time while not hiving swarms could be profitably utilized in keeping up the work of the apiary he had in charge.

Right here it may be suggested that it is the belief of not a few extensive bee-keepers that more colonies may be profitably kept in the average location than has heretofore usually obtained. If this be true, and the bee-keeper with one or more out-apiaries could increase the number of his bees in each

apiary, an attendant might be profitably employed constantly during swarming time.

There is one plan of swarm control that has heretofore been the subject of discussion in more or less of a desultory fashion, but which seems to me to merit exhausted experiment by every apiarist who is making a specialty of bee-keeping, and especially the comb honey producer, and here I refer to the plan of having a queen of the current season's rearing introduced into every colony that is at all likely to swarm just prior to the swarming season. It seems to me that this plan is the most fruitful of possibilities of any that has been discussed, and that concerted experiments by many apiarists with this means to arrive at the desired end can not but result in much good to the craft.

It is said that colonies with such queens will not swarm. While this theory may not be absolutely infallible, the fact that an apiarist of prominence has practiced re-queening with queens of the current season's rearing for the very purpose of controlling swarming, lends strong color to the belief in the success of the plan. Here we have, then, something that is practicable, something the success and profit of which depends not entirely on the single factor of swarm control, but which yields a profit by reason of the better service of the young queen than we might expect from the average queen a year old or older.

There is seldom, if ever, a season when an apiary of a half score or more of colonies will not have at least one and often several of them, very strong during apple bloom. In fact swarms are by no means uncommon during this period, and ordinarily good queens are produced without the extra devices and manipulations employed by the queen specialist. At comparatively trifling expense the apiarist can easily equip himself with such devices as will make it reasonably certain to breed queens with precision during the apple bloom period. If the season of bloom is unfavorable to honey production, resort may be had to stimulative feeding of the strong colonies selected for queen-rearing in order to bring and keep them in the best condition for the purpose. With queens reared thus early there is plenty of time to form nuclei, and build up colonies in time for the main honey flow from clover and basswood, which is also the main swarming season. Does it not seem an easy matter to thus provide early in the season, a young and vigorous queen for each colony at a trifling expense? Is it not an easy matter to simply substitute a newly-made nucleus in place of each colony and transfer the latter to the former, thus building up the nucleus to a full colony at practically one operation? Is not this an easy plan of making all desired increase at the least expense, and at a time when the bee-keeper is not rushed as is the case when swarming is in full progress at the height of the honey flow. It will be apparent to the practical apiarist that profitable use may be made of all old vigorous queens by keeping them in strong nuclei for the purpose merely of brood production with which we may from time to time replenish our honey-producing colonies, thus keeping them so strong as to insure a maximum crop of honey if the flowers secrete the nectar. None will doubt that these young, vigorous queens will not more than pay for all the trouble and expense of their rearing in the additional strength and productiveness of the colony.

Assuming that it is reasonably certain that a colony containing a queen of the current season's rearing will not cast a swarm, we have here a practical and effective plan of swarm control; one that requires no extra devices or special hives; one that requires only such work as is necessary in making

artificial swarms; one in which the work may be done out of the busiest season; one in which a greatly increased profit in honey production is at once to be expected, more than sufficient to compensate for all the extra trouble and labor in rearing the queen; and one in which the normal status of the colony is not esentially disturbed.

Discussion.

Mr. House: I don't know that I could add anything to what Mr. Herschiser has said, only as an endorsement of the fact that by the introduction of a young vigorous queen before the honey season opens you have done away with the propensity to swarming. It is an easy matter to produce those queens at that time, and even though you could not produce them you could afford to pay a dollar apiece for them and coin money.

Mr. Herschiser: I spoke of the easy matter with which young queens can be produced at that time. A few colonies always get very strong during apple-bloom time, and by examination we find some of them are starting queen cells, and even at such time as that they are very easily encouraged to start them, and by working up these strong colonies into nuclei, and getting the young queens, we very soon have enough of these nuclei to be able to substitute one for every colony that will make a good comb honey producer that season. But, if the comb honey producer does not feel capable of undertaking that work, queens can be purchased at a profit at that season of the year, because you have got the use of them for the whole summer following. I think we ought to experiment a good deal on that. If it is true that a young queen of the current season's rearing will not cast a swarm, it seems to me there is nothing more effective to prevent swarming than just that simple remedy.

Mr. Pettit: It seems to me we have here an excellent paper on one of the most important subjects that we have before use in our business, that is the matter of controlling swarming, and the proposition which Mr. Herschiser has given us is a good one—the idea of putting a young queen of the season's rearing in a colony in order to prevent swarming. I wish to refer to the point which Mr. Herschiser touched on last before he sat down, of whether it is better to buy queens or to rear them one's self. In Mr. Herschiser's proposition he has, I understand, broken up several of his best colonies before the beginning of the season. You see what a loss this means. Each man can figure up for himself what his average yield from his hives is for the season. It is so many dollars from each hive. You can figure that the best stocks are above that. You have broken them up. Would it not pay better to spend the money that you lose in that way in getting queens from one who makes a specialty of rearing queens, and buying them from him by the dozen? He can send them to you just when you want them, and they are just in shape for introducing for the season's rearing. That has been my practice for several years. I buy up in the hundreds during the year.

Mr. Herschiser: I want to know how successful it is in preventing swarming?

Mr. Pettit: I have not used it in that way. It is just for increase.

Mr. Byer: Do you get good queens at that season?

Mr. Pettit: I have got very good queens.

Mr. Anguish: I think a man gets well paid if he does break up. He breaks his best colonies up to raise his queens, and he gets the best results I think in that way.

Mr. HOUSE: The question, as I understand it, is, will a young queen reduce the swarming impulse or eradicate it? A queen raised the fall previous and introduced will not retard swarming in the following spring, although you receive the entire benefit of her youth; those bees that pass through the winter with her will go on with that same swarming impulse. By rearing a young queen just previous to the swarming impulse coming on, you will then pass through the swarming season without the swarming fever. As to breeding from those colonies that are apt to be strong in the spring, I believe that bee-keepers to-day should put down their foot on breeding hap-hazard from their yards. We should breed from our strongest colonies that have shown themselves during the previous spring to be good honey gatherers and to be strong in vitality; then we can get good cells with our artificial methods, and by the little fertilizing box we can produce queens abundantly. On the question of whether we should produce our own queens or buy them, I know that with us in the States we must produce our own queens, as our queen breeders are forced beyond their capacity, and it is a matter we must get into.

Mr. CHRYSLER: I would like to ask Mr. House how he gets that queen into his colony that he wishes to produce honey from? And instead of forming nuclei why not put that queen cell in a hive body underneath the queen excluder with the old queen above in part of her hive, such as, for instance, in a divisible frame hive?

Mr. HERSCHISER: Those are matters of detail. Some people have had success in strengthening a weak colony over a strong one, and some have not. I am one of those that did not succeed very well in that direction; but, so far as introducing the nuclei to your other colony, that is very easily accomplished by simply moving the colony that you want to introduce the queen to off the stand, and setting a hive in its place, and transferring your brood and letting the bees return to the stand and hive.

Mr. BYER: Do they never bother the queen?

Mr. HERSCHISER: I have never had any trouble with a nuclei of two or three frames of brood.

Mr. CHRYSLER: What about the queen in the old colony?

Mr. HERSCHISER: As I said before, leave enough bees with her to enable her to raise brood to strengthen the colony through building up for comb honey.

Mr. TIMBERS: With regard to what Mr. Chrysler has said, I have repeatedly tried that plan, and in every case, unless they had queen cells started previous to the division, they will tear the cells down every time, but they will very often accept a virgin queen.

Mr. HERSCHISER: I think you do better by rearing the young queen above and leaving the old one below.

Mr. HOLTERMANN: Did you put that queen cell in directly after you divided?

Mr. TIMBERS: I have tried it both ways, one, two and three days after.

Mr. CHRYSLER: I have had them neglect that lower storey for a certain time, and they have even taken down eggs from above and left the queen cell below, and I have got an excellent queen down there. I have instances of that.

Mr. TIMBERS: That wouldn't be in one or two or three days; if you wait five or six days you will.

Mr. CLARKE: The way I do is, I have a frame that is just half the size of a Langstroth and I take one of brood which is ready to hatch. I enclose it and I insert a queen cell and let it hatch, and let it stay in there and

fertilize it. I never remove it till she has laid three or four days. In fact I don't move it until some of the cells are capped over. By that time they have a large amount of brood, enough to perpetuate. By following that course a bee-keeper ought to rear at that rate nearly two queens a month and have them fertilized.

A MEMBER: When that queen is hatched or fertilized, what do you do then?

Mr. HOUSE: If they have plenty of honey I simply remove the queen. If she is allowed to remain in that little nuclei perhaps 48 or 72 hours you are liable to have it deserted. The amount of bees in there is so small, that in a very short period of time she caps all the comb the bees are capable of covering, and there is no room for her to lay, and she becomes discontented and deserts unless you put down that little piece of perforated zinc. I allow the same amount of bees to remain in the nuclei and remove my queen and introduce her somewhere where I am going to use her, and in a few hours insert another virgin, and I usually get two or three queens before I have to replenish the bees. But one important thing is to have plenty of honey in the card. I have had far greater success without brood than with it. I have abandoned all idea of taking brood.

Mr. CLARKE: The probability is they hatched so much brood that when they did hatch out it was so warm there that they left. If you made the capacity of the box a little larger so as to give them lots of air, so that they wouldn't swarm out, you could perpetuate that nuclei all summer—up to September anyway. We use that only during the swarming season when we can do it, but for queen breeding we use a hive with a capacity of six Langstroth frames with two nuclei in a hive. The frames are made so that they are about nine inches square, and we put on a false top bar, and when we want to put two together we put them in a large colony and let the queen lay in there, and when the brood is sealed we take them out and put on another false bar just half the length of the first one and insert that in the middle of the hive. We have six combs to the hive. In fact they are so large, you can winter them there. You take the division board out in the winter and put six combs of honey in and you will have no trouble in wintering. They increase instead of decreasing during the summer. I have often taken one small comb of brood nine inches square and put it in the hive and put one frame of foundation between that and the division board, and they will draw that out during the honey flow, where if you put two or three frames in they wouldn't touch the other and draw it out.

Mr. MILLER: With your present method of rearing how many colonies do you have to use up for a given number of queens?

Mr. CLARKE: I don't use up any colonies. We calculate to winter over at least one hundred, and they will be all right in the spring, and in a short time they will double. When I want to make new nuclei, I take these small frames and we have boxes six inches square with a three inch hole in the top, and then we have a large funnel made, the top of which is wider than a Langstroth frame, and we shake the bees on to that funnel, and they drop down.

Mr. MCEVOY: How far do you keep your nuclei from another colony?

Mr. CLARKE: Our rows are ten feet each way apart. There are four nuclei on one stand. The others are all ten frame hives. These that I get the nuclei from are five miles away, although I can do it in the home yard.

Mr. ALPAUGH: Mr. Herschiser has read a good paper and one well worthy of discussion. I think the main question was whether young queens would retard swarming. I can say in my experience it does to a certain

extent almost altogether, but not always. I have had young queens build up which would swarm again the same season, but it is not a common occurrence. There has been some objection raised to breaking up strong colonies to raise queens. I can't see any objection to that. You still have your queens; you don't lose anything. I thought that was a very good way of getting a good crop because those bees haven't the same tendency to swarming that the old ones had, and generally you get a good flow from the queens in that way. This gentleman over here says he has them hatched in a little bit of box hanging up on a clothes line or somewhere with fifty or one hundred bees. My experience is I don't want queens raised that way. I have found that they supersede before fall, which I never find with queens raised in a good strong colony or full nuclei.

Mr. HERSCHISER: Mr. Alpaugh's remarks interest me very much. I would like to ask him what percentage of colonies in his out-apiaries which he is not visiting very often would swarm with young queens. For instance, out of one hundred colonies, how many would he expect to lose in a good season by swarming? If it was a small percentage I would conclude the scheme was a success.

Mr. ALPAUGH: I wouldn't expect more than from three to five per cent.

Mr. HOLTERMANN: You mean you would have 95 swarms where you had the old queen and two with the young?

Mr. ALPAUGH: Out of these young queens built up strong not more than five per cent. would swarm during the season.

Mr. HOLTERMANN: Do you allow the stocks with the old queens to swarm, or attempt to prevent swarming?

Mr. ALPAUGH: I am simply discussing the paper.

Mr. HERSCHISER: What Mr. Holtermann is getting at is, suppose you ran your apiary without trying to introduce young queens, and with the old queens?

Mr. ALPAUGH: That is another question altogether.

Mr. HERSCHISER: In order to get an intelligent comparison, and to determine whether this will be a success or not, if you had an apiary of 100 colonies with old queens, an out-apiary you were not visiting very often, and they were all put in good shape for comb honey, how many of that out-apiary would you expect to swarm with the old queens and the same management.

Mr. ALPAUGH: About the same number, about three to five per cent., but it would necessitate a different management altogether.

Mr. HERSCHISER: I don't mean to have any further management than you would give the young queens. With me I would expect about 90 to 95 per cent. from the old queens.

Mr. HOLTERMANN: I have found that introducing the young queens does not prevent swarming. If you think you are going to have a system there, by means of which you know that swarming is going to be prevented, you haven't got it. That it may decrease the amount of swarming, I believe it does.

Mr. DICKENSON: I think we sometimes lose sight of the locality. What may work well in one locality may not work so well in another locality.

Mr. ALPAUGH: I am not at much of a loss in that respect because I have kept bees nearly all over the country. I have kept them in about twenty-five different localities, and I have had all kinds of flows to contend with, and yet I can run much on the same system and have the same results.

It is a matter of system and management in almost any locality, either for extracted or comb honey.

Mr. HOLTERMANN: I didn't quite understand about putting bees in the cellar. Did you say if you put them in the cellar for three days and then take them out they would re-locate themselves without any difficulty?

Mr. CLARKE: Oh, yes; no trouble whatever with me.

Mr. HOLTERMANN: If you have bees in the cellar and take them out in the spring you don't need to put them on the same stand.

Mr. CLARKE: I never do it. We keep our swarms ten feet apart. It is very seldom you see an apiary that way. That may make a difference.

Mr. HOUSE: In order to correct an impression which I think a gentleman on the other side had, I don't raise my queens in this nuclei; those cells are kept in my strongest and best colonies. The young queens are in there for the purpose of fertilization and nothing else; you can't take away from their vitality in that nuclei.

Mr. ALPAUGH: A queen has got to be properly fed by the bees as well as any other part of the stock, or she won't give you good results.

Mr. HOUSE: We will agree with that, but it doesn't take a whole army to feed her.

Mr. BYER: I know there are a lot of queens play out in a short time. I am under the impression that queen breeders use the small nuclei, and I thought there might be something in it. I know nothing about it personally. I bought twenty queens from a man in August last year, and they more than boomed ahead, and eight out of the twenty superseded this fall.

Mr. HOLTERMANN: Don't you think that is on account of injury in the mails?

Mr. BYER: It may be; I don't know.

Mr. PETTIT: I have always blamed such injury to the mails. I have found that by getting Canadian queens they gave better satisfaction than by getting them from a distance. As to this matter of new queens preventing swarming, there is a point that has not been very clearly brought out, and that point I have seen raised in the Bee Journals, that if the queen is in the colony in which she is reared and hatched that season then it will prevent swarming; but transferring from one colony to another seems to spoil the charm.

SHORT-CUTS IN BEE-KEEPING.

By A. C. MILLER, PROVIDENCE, R. I.

Whatever you do in bee-keeping, you have got to mix it with brains. The mere following of somebody's system will not always lead to success. Learn well the principles, and it may be found that the greatest economy of production is not accomplished by using the most expensive, nor even the cheapest equipment. You may be able to use any of a dozen methods or tools to advantage.

In looking for short-cuts—and comfort, even—the matter of clothing is important. I use common brown cotton goods, known as karki—really brown duck. This material does not soil readily, is easily washed, and does not annoy the bees, being smooth and hard surfaced. The trousers ought to be short, and take up at the bottom like riding trousers, so that the bees cannot get up under. They should be loose at the knee, so as to be cool. The shirt, too, ought to be loose, to be comfortable.

I like a large smoker, with large bellows; not that I believe in using a lot of smoke, but that I may have plenty of smoke in great volume when it is needed.

Scissors for clipping should be the kind known as surgical, with curved points, so as not to injure the queen.

The inside equipment for the honey house ought to be of the best and most up-to-date. Section folders and fasteners also, for fastening foundation in brood frames, and machines for cleaning sections; then come the extractors and uncappers. Extractors should be painted inside, and then a coat of white enamel put on, and after it is washed once or twice you will have something that will not taint the honey. For an uncapping knife go to a blacksmith with a pattern, and have him make one out of an old file. Grind this down and you will have something that will always hold its edge. For the purpose of taking the wax off the edge use hot water.

With reference to painting hives, I wish to call your attention to dipping. Dipping paints can be obtained from a painter or factory, and would be found quicker and easier than brushing it on. The use of the cleated separators cause more or less annoyance to users when they come to cleaning them. Dipping them in boiling lye as I would recommend for cleaning and disinfecting hives would ruin the separators. I have found that to dip them in either boiling linseed oil or paraffine wax, and another dip in clean water, will have them ready to use again.

The question of getting things from the yard to the honey house and back again is a problem to many. Right here I would suggest the use of an overhead track like the ordinary hay fork track, and attach to it a little chain hoist. Mr. Alexander said last year it was the very thing he was looking for.

A card record system will cut down the amount of work necessary to be done.

Judging inside conditions by external appearances is something that only a few bee-keepers attempt. This is a most valuable help in short-cuts. Most beekeepers are aware how easily they can discover a queenless colony by the appearance of the bees at the entrance. These are things however, that cannot be taught, but must be learned by experience and observation.

Bee-keepers could select a strain of bees with desirable traits and perpetuate them by raising queens from the most valuable type to accomplish the end aimed at.

As to clipping queens, I first clipped for swarm control, but now also as a means of identification. One year clip the right wing, next year the left wing, and next year both wings. This method will show you the age of the queen.

For the purpose of raising queens I can recommend the Pratt system, which I will describe: He takes for the purpose a hive with an outer case which will take 12-14 frames on a level side by side. He uses the Langstroth frame. He confines to one side of that hive six of the frames with brood honey and the queen by means of putting down a division board of perforated zinc. Over the top he lays another sheet of perforated zinc. He closes half of the entrance with a piece of perforated zinc. The queen is, as it were, in a perforated box. The workers can come and go as they choose. On the other side of that zinc he puts in three or four frames of brood that are nearly matured. If he has not at the start any frames that have no unhatched eggs he leaves them there until all those eggs are hatched, and all the larvæ pretty nearly ready to spin their cocoons. Then he proceeds to start his cells. He takes cell cups and transfers a larvæ to each one, and he takes a Langs-

troth frame, and he has three little strips that fit across it made of folded tin, so as to be stiff. By means of a cutter he has opened a hole that will take in one of these wooden cups, and that hangs about three inches from the bottom of the frame. The bees go to work and mature those into queens. So far as those bees know, they are queenless. If he wants to start a lot he will put one of these between every pair of frames he has on the queenless side. Just as soon as those are almost ready to hatch he transfers them to cages. Sometimes he has a row of cages across the top of each frame. Everything is going along as normally as if nothing out of the ordinary were happening. A comb honey super is being filled over the side where the queen is confined by the zinc enclosure, and there is no limit to the amount of queens that may be raised. Before the young queens hatch, and when they are quite mature they are dropped into a cage, the alley cage, or what is known as the common mailing cage, being used for this purpose. In introducing queens to full colonies or nuclei, I use the Simmons method of direct introduction.

REPORT OF THE EXECUTIVE FOR 1908.

The membership of the Bee-Keepers' Association has remained practically stationary, the total being 246. Of this number 154 came in from affiliated societies, and the balance in single subscriptions.

The inspection for foul brood was carried on during the year along similar lines to 1907. Three additional Inspectors were appointed in the western part of the Province and the districts were re-organized. In the east, Mr. Homer Burke, of Highland Creek, spent some time among the apiaries of various points and we are hoping from his report that the Department will go ahead with the appointment of Inspectors another year for this portion of the Province.

In reference to the Honey Show, it was decided to continue the offering of prize money along the same lines as last year. A few changes were made in the rules, but the list itself was allowed to stand. The number of entries is well up to the standard of other years.

Through the kindness of the Department, a circular was sent out to all bee-keepers in the spring and from the replies received thereto a special report was issued showing the condition of the industry. The number of affiliated societies remains the same as last year. A grant of $20 was made to each association for the carrying on of their work. The number of members from these associations was as follows: Brant, 13; Glengarry, 10; Halton, 17; Middlesex, 28; Norfolk, 18; Oxford, 12; Russell, 12; Simcoe, 8; Victoria, 15; York, 11; Haldimand, 10.

REPORT OF HONEY CROP COMMITTEE.

By W. J. Craig, Brantford.

Though not chairman of the honey crop committee, it gives me pleasure on behalf of the committee to report that we, through our secretary, P. W. Hodgetts, issued the usual enquiry card to the members of the Association and others. We received a very much larger response to these than in any former year that I have been connected with the committee, which certainly

assures us as a committee of the increased interest and confidence of the bee-keepers. We also received reports from the Province of Quebec, Nova Scotia, and New Brunswick. We met in the secretary's office in the Department of Agriculture on Friday, July 31st, and gave the reports our most careful and impartial consideration, reporting immediately our findings and conclusions to the public press, and by circular to the members of the Association and to others who had favored us with their reports. A later circular was sent out in regard to the buckwheat honey, which we believe has been of value to bee-keeping, having a surplus from that source. From the answers to the queries in the later issue of cards we concluded that the prices suggested by your committee had in the great majority of instances been realized, and we believe that commission men and dealers are now recognizing the report of your committee as a reliable source of information governing the current prices for the season.

REPORT OF TORONTO EXHIBITION REPRESENTATIVE.

By E. Grainger, Deer Park.

During the years 1907 and 1908 I made it a point of attending not only all the meetings directly connected with the Honey Department, but also several other meetings called by the Chairman of the Agricultural Committee, of which the Honey Department forms but a small part, I had a special object in attending all these meetings, as I found the claims of the other and larger branches, such as flowers, fruit and vegetables, were given more prominence, and the honey interests were liable to be side-tracked unless someone was on hand to put in a word for the bee-keeper. In fact, I found there was a strong feeling against having the honey shown in the new building, though it is most suitable for this purpose. As the other departments become more crowded it is altogether probable the honey men will be the first to suffer. This is no doubt due to the fact that the honey exhibition is regarded more as a commercial undertaking than any of the departments mentioned.

We honey men have a good friend in the chairman of the Agricultural Department, who has always shown a lively interest in our industry, and endeavored to give us fair play, notwithstanding that strong opposition has sometimes been brought to bear. I am also glad to say that Dr. Orr, the able manager of the Exhibition, has always given consideration to any reasonable proposition looking to the improvement of the show along new and broader lines.

I understand that the changes made in the Prize List for 1908 were not entirely satisfactory, particularly the cancelling of the rule that all honey shown should be the product of the exhibitor's own bees. During the four years that I have had the pleasure of representing the bee-keepers on the Exhibition Board, I have honestly tried to ascertain the views of the bee-keepers interested, and have urged them when giving my annual report to write me, giving their opinions on this and similar matters. By far the larger number of those who took enough interest to reply, advocated the changes which were made, on the ground that when there was no way of knowing whether or not the exhibitors were living up to the rule, it were better to have such rule cancelled entirely, thus putting all exhibitors on an equal footing. Further, it was the opinion of the exhibition manage-

ment that they would get a better display if this rule was not strictly enforced. Some of the best writers in the United States, as well as the managers of the largest State fairs, have struck out this rule from their prize lists.

In conclusion, I may say that I have no apology to offer for my actions during the time I have been on the Exhibition Board. I am prepared to give good and sufficient reasons for anything I have done. I have conscientiously tried to represent the best interests of all the exhibitors, irrespective of my own views and interests, and have on all occasions tried to serve them to the best of my ability.

PRESENTATION OF A GOLD WATCH TO MR. W. COUSE.

Mr. Holmes, on behalf of the Association, then presented Mr. Couse with a handsome gold watch, and in doing so read the following address:

To Wm. Couse, Esq.:

Dear Sir,—We, your associates and co-workers in apicultural pursuits, would ask your indulgence for a moment, and ask you to kindly pardon us for detaining you while we speak to you on a matter which may seem to you of trifling or no importance, but which we think worthy of immediate consideration. As Secretary of the Ontario Bee-keepers' Association for a number of years you have been more or less in the limelight, and your excellent and sterling qualities have not been unnoticed by us; indeed, we for years have known of your work and are proud to believe that your star will continue in the ascendancy until lost in the splendor of the 'High Noon' of Life. Your keen foresight in matters pertaining to our industry, and your knowledge of detail in the working out of the same, have been of great value to our Association during all these years. Your cheery greeting is an unfailing inspiration; in fact, your 'Good morning!' seems actually to presage a 'real good day.' We have been watching you, and now that we have come to the parting of the ways, and you are no longer our secretary, we desire still to 'watch' you, and we beg your acceptance of this gold watch as a slight token of our appreciation and regard for you. We trust that with this timepiece pleasant memories will remain with you while the sand in Life's hour-glass slowly but surely spends itself, and that at the close you may in retrospect have the comforting assurance that—

'Those who strew the violets shall reap the corn,
And, having reaped and garnered, bring the plow
And work fresh furrows 'neath the shady morn,
And plant the Great Hereafter in the Now.'

Signed on behalf of the Association:

M. B. Holmes.

Mr. Couse: I don't know I am sure how to express myself. I really feel it is given as a token of friendship, and I shall ever wear it and care for it as such.

I do feel, candidly, that I owe the Association very much, and I owe it in this respect, that I have been treated with the greatest of courtesy in all the work I have ever done. I have always taken everything I had to do in a serious way.

Now, I think I ought to sit down; but, gentlemen, I don't know that I ever received anything, except my wife, that I appreciated more. (Applause and laughter.) I really thank you with sincerity, and I shall ever be glad to wear this watch in remembrance of you.

HABITS OF THE BEE.

By A. C. Miller, Providence, R. I.

There are two or three little things I may possibly be able to tell you which will furnish food for thought, and, while they may not enable you to step right out into the yard and immediately increase your crop, I think you will find they will ultimately prove of profit to you. I was going to talk to you about the habits of the bee. I will only touch on a few points.

Heat is the most potent factor in bee life. When you are considering the production of queens, honey, and those things, remember to keep up the temperature by proper food containing sufficient of the hydro-carbons of sugars, and by reasonable protection from the weather.

I want to call your attention to the establishment of a publicity or press bureau. I told your present and past presidents something about what Worchester County has done in that respect. The Worchester County people took the pains to go to the superintendents and teachers of the different schools and say, "We are going to have a lecture at the Horticultural Hall on bees; let your teachers and children come down." Three or four times a year they have one or two such lectures for the general public. The principal features of those lectures are well written up in the papers, and by careful, diplomatic work, I have seen that big hall filled with men, women, and children, interested in bees.

As to the breeding of bees, it differs from that of all other domestic animals in that you cannot use the same male twice, and you cannot use the same female twice. With bees we have to take sister queens and brother drones and mate them and test back. Darwin said the bee was the least variable of all animals with which he was familiar. We, by the introduction of races from the tropics and different races of the world, have got the bee to vary somewhat, but that is limited to two things, color and temper. We are beginning to realize certain strains of bees are more resistant to disease than others. You will find exceptions all through the animal life. Man, by taking advantage of the exceptions which are of particular value to him, and by breeding and selection, has accomplished a great deal. Some of the variations are of no value to us. You have been told many times to select your bees and to improve in that way. We have a co-operative seed producing arrangement established by our experimental stations. It is extending all over the country; it goes on the selection and exchange of variations that are favorable. Zoologists have found that the selection of variations can carry us quite a little way, but there is an outside limit. If you are going to look for positive improvement you have got to look for it in sports or mutations. It is the general belief among ordinary breeders that mutations are rare. Scientists are just awakening to the fact that they are common. A sport or mutation is an absolute and positive re-arrangement of hereditary traits, and where you get a true sport or mutation that will always breed true. Another valuable and seemingly strange thing about a mutation is that when you get that you may have got it from breeding in, and you have got a renewed vigor just as if you had crossed in new blood. Bee-keepers will gain much if they will learn to look for those new creations, and always bear in mind the correlation of the different functions. You speak of black bees being cross; it is a correlation of black and blackness. You find the exception in the Carniolan. You speak of crossness going with the Cyprian. It is a relative term. You speak of a yellow bee and a black bee. Yellowness is merely the absence of

black. With scientists the absence of a color is a different thing from change of color. Blackness is a pigment. The blackness is more powerful than the other; it is what scientists call a dominant trait. The absence of black is the least powerful. Take a plant of the tall species and a plant of the dwarf species and cross-pollenate them, and all the plants will be tall. The more different things you introduce that way the more complex and difficult your observation will be. Take any of those plants, pollenate each individual plant and you sow the seed, and for every lot you get this ratio, three talls and one short. Take those plants and breed them each with its own pollen, and the dwarfs will always breed dwarfs and nothing else. Of the talls we get this ratio: one tall, which always breeds tall; two talls, which will breeed talls and shorts; the ratio of three to one is always there. With your bees you have got to be careful in selecting your males and queens in crossing. You have a problem to study out. You have to bear in mind the principles and work it out for yourselves, but your chief value in increasing your honey production lies in your finding the sports or mutations and perpetuating them. They are worth looking for. One other word in regard to the breeding of bees. In mating drones to queens you get a ratio of two and one. The queen contains a father's blood and a mother's blood; the drone contains only the mother's blood. You have a colony which has produced certain results; it has perhaps this sport or mutation you are looking for. What drones are you going to use? From the same mother? But that queen blood that produced workers upon which you are depending is the result of the union of the male and female cell. The drone is only the female cell, and you are bringing in only one half of your original stock What are you going to do? You will raise one generation of queens and let them mate as they will, but everyone of the sons of that generation is like the mother of the queen.

Mr. Wild: Where is the literature to be found as to the method of introducing queens?

Mr. Miller: The facts governing that are some thirty years old, but they were lost. About six or seven years ago some student ran across them, and it proved to be a bomb-shell. It is known now as Mendal's Law. There is a little book published in England called "Mendal's Law." Another book which will probably help you is called "Experimental Zoology," by Prof. Morgan. It shows how to make corrective experiments which is very important to the bee-keeper. On practical bee-keeping I would recommend a book by Samuel Simmons, called "The Modern Bee Farmer."

The Uncapping Machine.

Mr. Wm. Bayless, of Brantford, spoke on the use of an uncapping machine to replace the knife. He illustrated his talk by showing a machine of his own invention, which he claimed would do the uncapping nicely and quickly, provided the combs were built out past the end bars. The machine was not yet perfect, but he had been improving upon it from time to time.

Mr. Armstrong: I might say that I was over in Brantford and saw this machine a year ago when Mr. Bayless got the first one out. He has also another machine that takes the frame the other way. I had this machine at my place; it was at the end of the season; I was anxious to try it, and found it did splendid work. The only trouble I found was with the Hoffman frame having wide end bars. Take seven frames and put them in an eight frame hive with no followers in it, and have the frames built out even with the bars

and put them in that machine, and you can put an inexperienced boy there and show him in two minutes how to work the machine. When he gets the frame through there it is like a board going through a planer; it gets better every time.

Mr. McEvoy: Did you try it with new comb?

Mr. Armstrong: I tried it with new comb built on foundation this year, and also old ones.

My boy has taken off all my crop this year with Porter Bee Escapes, and we have had no difficulty in extracting it at all. As far as the machine goes it will do the work all right.

Mr. Bayless: I have used it on cold honey, and I can see no difference whether the honey is cold or warm. I don't think it makes a particle of difference, but if it did it is an easy matter to have a soft wood stick and give it a rub over the top of the knife.

At this point a short discussion ensued on the question of exhibiting honey at fairs and exhibitions, as to what prizes should be given for, and as to who should be entitled to make exhibits. The discussion was participated in by Messrs Anguish, Evans, Timbers, McEvoy, F. J. Miller, Couse, Dickenson, Herschiser, House, Holtermann and Chrysler. Considerable fault was found with the fact that exhibitors were allowed to exhibit honey which in many cases was not their own production, but which they gathered up from different sections of the country, and it was felt that this gave them an unfair advantage over those who exhibited only their own productions. Some diversity of opinion was expressed also as to whether the highest premiums should be given for the best display of glass, without reference to the quality of the honey, or as to whether those premiums should rather be awarded with reference to the quality. The general consensus of opinion was that every exhibitor should make an affirmation or declaration that the honey which he was exhibiting was his own production, and that no man should be allowed to make an exhibit of honey other than his own; also that any man who made a false declaration in this respect should forfeit his premium. It was also the opinion of some that separate premiums should be awarded for the best quality of honey, and also for the best display of glass, in order that those exhibiting honey for its quality should be competing one against the other, and those exhibiting for display should be competing one against the other.

THE INCREASE IN THE IMPORTATION OF HONEY INTO CANADA.

By R. F. Holtermann, Brantford.

The subject which has been assigned to me is one of no small importance Knowing that the importation of honey into Canada must be largely on the increase, and particularly that of the lower grades, and being alarmed at the prospects of another special tariff arrangement with a tropical country which I am informed is adapted to the production of large quantities of low grade honey, I thought that the cheapest and best way to put the facts before the bee-keepers and those interested was to have the matter with facts and figures brought before the Dominion House of Parliament. I therefore wrote to one personally known to me, and asked for a return to the House of the imports of honey during the last ten years. Mr. Foster, the member referred

to, very kindly not only asked for a return during the last ten years, but for twenty, being from 1888 to 1908. I give the table for the fiscal years as follows:—

	lbs.	Value.		lbs.	Value.
1888	18,666	$2,312	1897	26,149	$3,003
1889	46,184	4,914	1898	43,232	3,920
1890	39,585	4,650	1899	83,888	8,579
1891	25,999	3,653	1900	142,973	13,634
1892	28,699	3,751	1901	129,768	10,953
1893	15,812	2,207	1902	135,955	9,019
1894	25,339	2,463	1903	121,240	7,886
1895	11,984	1,404	1904	119,124	10,046
1896	32,052	3,504	1905	115,735	9,141

1906.

	Lbs.	Value.
Great Britain	4,699	$131
Australia	2,368	113
British West Indies	17,579	459
Hong Kong	1,759	49
China	491	12
Greece	144	40
United States	56,594	6,752
Total	83,634	$7,556

1907 (9 months).

Great Britain	8,031	290
British West Indies	131,370	4,147
Hong Kong	248	5
China	738	18
Hawaii	1,200	72
United States	182,066	15,738
Total	323,653	$20,270

1908.

Great Britain	20,510	1,172
Australia	2,895	186
British West Indies	325,645	10,034
Hong Kong	866	25
China	502	15
Hawaii	4,080	210
Japan	60	2
United States	266,572	23,731
Total	621,150	$35,405

It will be seen from the above that honey imports have enormously increased. During one fiscal year (9 mos.), 1907, the amount imported was 323,653 lbs. and for 1908 report 621,150 lbs. Under the preference 33⅓c. has been taken off the duty on honey from the British West Indies. Imports of honey have grown from this latter source from an average of 172 lbs annually from 1888 to 1895 to 131,370 lbs for 1907 and in 1908 to 325,645. No doubt the preference has militated to this end.

But this is not all. We find Great Britain is importing honey to Canada at an average price of 5.7c. per lb. I have already pointed out publicly that this cannot be British honey, but no doubt it is honey which is coming in under the preference, and to which it is not so entitled, Great Britain only being a medium for illegally securing the preference.

The question may be asked what shall the remedy be, and is it in the interests of the Dominion to encourage the country to produce its own honey? This paper would be too long to add to it a eulogy of Canada honey. What it has done it can do again in connection with getting verdicts as to its excellence when compared with the honey of other countries. Consider also the value of bee-keepers to fruit growers, clover seed and buckwheat growers. It is not my intention to bring up the matters of protection in its varying degrees, nor is it my intention to cross swords with free traders if any there are, but the goods we use are protected. In fact, the majority of them have been raised from 20 cents to 25 cents, and it appears to me that bee-keepers should put themselves on record as opposed to any further concessions in this direction.

It may be asked shall we seek to increase the duty on honey? This in my estimation is scarcely practicable, and in my estimation unnecessary, providing a proper distinction is pointed out by the help of the Government to the people. Of course, the importation of honey from Great Britain at prices below what it sells at in that county is clearly a fraud and should be stopped at once.

Again honey is imported in various packages, and the duty should be insisted on to cover these packages. For instance, honey tins cost us close to a cent per pound for the honey stored. We in our purchases are restricted by a duty on the packages, putting both parties on an equal footing. It is, however, much worse in the case of honey imported in glass. I doubt if the duty is paid on the glass, labels, and boxes. We have to pay a duty of 25 to 35 per cent. on these goods, and with this legitimate protection we would be protected on the goods, and this would make a difference of five to ten cents per dozen In this case all that is required to be done is to enforce the present law. The invoices generally have only the honey on them, and not the packages, and therefore duty is evaded.

What we then should ask for is that there shall be no further concessions to other countries, and particularly to those which produce inferior honey. This honey, in order to secure a market at even the lower price, must be sold without giving its source. It leans on the reputation of our own good Canadian honey, our capital, and therefore ours as much as anything else we possess. And our loss comes in where such honey spoils the trade for honey in the homes where we have created it.

We should ask that all foreign honey be analyzed before it passes the customs. A recent letter which a large wholesale grocery firm received from a firm in the United States shows the vigilance on the part of the United States and the danger to Canada with the amount of vigilance at present observed. It reads as follows:—

"We have mailed you two fair sized samples of honey which we import especially for bakers' use, but should you require larger samples advise us, and we will send them to you.

No. 1. Fany in bbls. 4c.; in cases (2 cans in a case), 4¾c.

No. 2. Choice in bbls. 3¾c.; in cases, 2 cans in a case, 4¼c., in bond, net cash f.o.b. there.

"We have been shipping to Canada, and so far it has given entire satisfaction, but under the rulings of the United States Government, if we heat this honey to clean it, it will show a slight excess of cane invert sugar, and claim we should brand it "Invert sugar and honey," although its purity has never been questioned, for what is honey but 90 per cent. invert fruit and cane sugar, and in our opinion it is all wrong. The largest bakers in the United States use it, and they claim they prefer it, because it is always clean and uniform, which makes their cakes uniform. We have been

shipping this honey to Canada, and although the Canadian Custom House will allow it to enter Canada, we thought best to explain it. You can order a few barrels to try before you buy larger quantities, as we would rather you tested it. We ship a great deal to U. K. and Continent."

It has already by various inspectors been pointed out that honey from doubtful sources is a menace to the health of Canadian apiaries. We should have the assurance from the Customs Department that no more honey shall be imported under false pretences, and that glass, printed labels, tins, and manufacturies of wood shall not go duty free simply because they contain honey and are not on the invoice of importers.

Mr. PETTIT: This question of Mr. Holtermann's is of eminent importance to us as honey producers; and coming right along in line with the address which Mr. McGill gave us the other day, it seems to me very fitting that we should take some action. These figures Mr. Holtermann has given to us are alarming. To think there are hundreds of thousands of pounds of honey being imported into this country, and to think this honey is coming in in an illegal way and undermining our market because of the evasion of the customs, not paying duties on packages, and coming in illegally under the preference—if that is the case we should do all we can to have that thing stopped. I have not considered the matter enough to put it in the form of a resolution, but I should think a resolution framed and presented by Mr. Holtermann would be in favor at this time.

Mr. EVANS: I have felt for a long time there was a great deal of honey coming into Canada illegally, because otherwise it could not possibly be sold at the price that it has been. It does not seem to be anybody's duty to look after it. I believe the executive of this Association, or some parties, should be appointed with the special duty given to them to look after the importation of honey, and if it does come in here illegally they should pay all the charges against them. I am out of sympathy with both of the political parties on this question of giving preference to any other country. I think our duty should be levied for the sole benefit of our own country without reference to any other country whatever. Otherwise it is going to work mischief in Canada. I think it is a matter of bringing it to the attention of the proper authorities at Ottawa.

Mr. HOLTERMANN moved, seconded by Mr. CHRYSLER, that the Secretary be instructed to act along the lines suggested in this paper.

RESOLUTIONS.

It was moved by R. LOWEY, seconded by ANGUS GALBRAITH, that the Ontario Bee-Keepers' Association appreciate and heartily approve of the liberal methods devised and put into practice by the Department of Agriculture for the assistance and encouragement of Apiculture and for apiary inspection.

Mr. BROWN moved, seconded by Mr. J. H. REED, that the Minister of Agriculture be requested to appoint a fit and proper person in each district to act as Foul Brood Inspector, where there are none at the present time.

Mr. BROWN, in moving the resolution, said that while they did not have much foul brood in the east, still it was better to keep it out; there were a number of counties without a resident inspector, and he thought they had a right to have at least one in each district, and he would ask the members of

the Ontario Bee-Keepers' Association to see that each part of the Province received fair play and justice. In support of the resolution Mr. Brown read a letter from the County of Dundas.

Mr. HODGETTS: Next year I hope we will be able to get a little more money for inspection work, and we will recommend to the Minister that additional inspectors be appointed for the east. Up to this time we knew very little about the east. It was almost impossible to find men there who had had any experience with foul brood.

It was moved by Mr. BEAUPRE, seconded by Mr. TRINDER, that no director shall hold office for more than five years. Retiring directors shall be open for re-election at the end of two years.

The PRESIDENT put the motion, which, on a vote having been taken, was declared carried.

LEGAL DEFINITION OF HONEY.

The following motion covering the definition of honey was carried:—

Recognizing the importance of legal definition in the case of honey, this Association respectfully recommends the adoption of the following description as embodying the present state of our knowledge regarding Canadian honey.

Honey is entirely the product of the work of bees (*Apis Mellifica*) operating upon the nectar of flowers and other saccharine exudations of plants, and contains not more than 25 per cent. of water or more than 8 per cent. of sucrose (cane sugar) nor less than 60 per cent. of invert sugar. It does not give a blue color with iodine (absence of starch syrup), nor a red color with aniline acetate (absence of artificial invert sugar), nor a dark color with Ley's reagent (ammoniacal silver), nor a marked precipitate of dextrin on adding large excess of alcohol (absence of glucose syrup).

DISTRICT REPORTS.

By W. J. BROWN, CHARD, DISTRICT No. 1.

As to the honey industry in my district, I am pleased to state that I have received very full reports from Prescott, Dundas, Glengarry, Stormont, and the adjoining county of Russell in District No. 2, and in general those reports go to show heavy losses the past two or three years, caused by the severe winters and the long, cold springs. No report so far this year has laid the cause of losses to foul brood.

One expert from Glengarry county says the honey crop was 20 per cent. better than last year, but the price of extracted honey was 1c. per pound lower, and section honey sold for 25c. per case less than last year. Bee-keeping is on the decrease in this section.

Another report from the same county says the honey crop has been very good, prices good also. Bee-keeping is about at a standstill here. If anything, it is going back, owing to the heavy losses of 1905, 1906, and the basswood trees being cut away. About St. Raphael's there is a blue weed, known by many names, such as Blue Weed, Bishop's Weed, etc., and is said to be a great honey plant, but on the other hand is a regular curse to the farmer. I may say that the weed referred to is no stranger to me, as it is a perfect nuisance to the farmers throughout all the eastern portion of Ontario, and is known under various names, such as Chickory, Bachelor's Button, and so on, but I have yet to see the honey bee working on the plant.

One very encouraging report comes from Prescott county. The writer says, "I found this year extra good, and last year we considered good also, but the two previous years were almost total failures. Prices both last year and this are well maintained and the demand constantly increasing. Less bees are kept now than formerly. So many careless ones are making nothing out of their bees and giving up in disgust." I might say that similar reports have reached me from all of the other counties mentioned. The additional remark was received from a Dundas correspondent that he "had the pleasure of having a visit from an inspector this year, and if we had regular visits from inspectors it would be a great benefit to us."

To sum up with: Less bees in the district; demand for honey increasing; prices higher; those in the business endeavoring to cultivate a home market and produce a better quality of honey at the lowest possible cost.

By A. A. Ferrier, Renfrew, District No. 2.

As to the extent of bee-keeping in this division, there is little change from former years. The number of small "farmer bee-keepers" is possibly on the increase. I only know of one other beside the writer who is depending solely on bees for a living. The wintering here is altogether cellar wintering, which I think is the best way for this locality. The success or non-success of wintering here, provided you have a good cellar, is simply a case of feding up well in the fall with sugar syrup, as there is little or nothing to be gathered after the close of the white honey flow in July.

The honey crop for the past season where bees were in condition was just about the average for the past ten years. Clover started in well, but was cut short by the drouth, but basswood yielded fairly well and made up for the deficiency in clover. As to the prices, they have been the best the writer has received yet. My extracted honey has netted me about 11c. I find the market in our western provinces steadily increasing from year to year. In fact, the bulk of my honey this year went west of the lakes. I personally marketed my section honey in Winnipeg and found it paid me all right.

I believe it would pay all right to personally market our extracted honey at the small towns all through the West. If the quality of our honey is kept up to the mark I think the West will swallow up all the surplus we can produce in the East.

By M. B. Holmes, Athens, District No. 3.

Those engaged in apicultural pursuits in my district have not escaped the general reverses which have swept from end to end of Ontario, and I think the statement (Bulletin No. 166, Ontario Department of Agriculture, on Bee-keeping in Ontario) that the total colonies in Ontario must be reduced 33 per cent. to cover losses of 1907 and 1908 would apply very well to my district.

This heavy loss was very largely the result of the unprecedentedly severe drought of 1907, which left very many colonies over this district short of stores and short of young bees on entering winter. I failed not to give the warning at all yards which it was my privilege to visit, to "Feed, feed, feed." "Do it now," "Do not forget it."

The many complimentary messages which I have received during the season just closed give ample evidence that those who followed my advice not only saved their little pets, but secured a good crop of honey as well.

Other causes there were which contributed in part for the losses, and among these I would note the *neglect to re-queen;* this is noticeable among fruitmen, farmers and others who keep from a half dozen to forty colonies

of bees as an "unimportant" adjunct to their other principal line of work.

In this connection we must also note that this class of beekeepers stand pre-eminently in danger of suffering loss from the ravages of foul brood, as, in many instances, they pay practically no attention to the inner workings of their colonies and are therefore quite unaware that the dread contagion is, or may be, doing its deadly work among their bees.

Instances of this kind have come under my notice, where the owners of diseased colonies were unconsciously keeping that which greatly endangered the entire business of the neighbor who made a specialty of bees and honey; and if by a more thorough system of inspection, or by the formulation of some other, and perhaps better plan, this danger can be obviated or reduced to a minimum, a great barrier to the expansion of the honey industry will have been removed.

There are many apiaries scattered over this district which are recovering from the reverses of 1907 and 1908, and which I am pleased to believe will continue to improve, under the encouraging and fostering care given by the Honorable Minister of Agriculture and his Department, until the "high-levels of prosperity" of former years shall have been entirely surpassed, and the art of bee-keeping much better known, and the value of honey as a food product will be generally understood by the community at large.

By R. Lowey, Cherry Valley, District No. 4.

Bee-keeping in this district, especially in Prince Edward County is, I might say, a thing of the past. 1907 was a total failure. Bees went into winter quarters in bad shape. The spring of 1908 was with us very cold and late, no bloom, nor was the weather warm enough for bees to gather until the twenty-third of May, when fruit bloom came out and the weather warmed up: Bees dwindled very badly during spring, and winter losses were also very heavy. At the beginning of clover bloom as far as I can find out the losses of bees in Prince Edward County was at least ninety per cent. My own loss in winter and spring was about 60 per cent. The flow from the different sources was good. Crop practically nothing, owing to want of bees to gather it. Prices of bees and honey have advanced say about 300 per cent.

By Jas. Storer, Lindsay, District No. 5.

Winter losses were very heavy, from 30 to 100 per cent. of the colonies of bees died, some of the small bee-keepers being cleaned out. The cause, no doubt, was the inferior quality of the 1907 honey crop, and the late, wet and backward spring. Dandelion and fruit bloom came in about May 20th and lasted only a few days. The writer commenced feeding the last week in May and continued for two weeks in June, and had good results. About 75 per cent. of a crop of clover and buckwheat were obtained.

I wish to thank the bee-keepers' exchange for their good work. The price of honey in our locality was advanced at least 10 per cent. after their report was received.

By Wm. Couse, Streetsville, District No. 6.

The industry is carried on to a considerable extent by those that are engaged in bee-keeping as a business entirely, but principally by those engaged in other pursuits. There are few but what have had considerable experience with bees, and it can be claimed that the industry is in an

advanced state, and that the honey product is of considerable value to the community or country. We regret that there still exists a little foul brood, as noticed by the inspector's report, but we are satisfied that the extra inspection being done is a great benefit to bee-keepers. One of the best ways of improving the condition in a district is by organization.

By J. F. Switzer, Orangeville, District No. 7.

In reporting conditions of the bee industry for this district, I may state that they have been on the whole very good, and bee-keepers generally have been well rewarded for their labors. The greatest drawback has been spring dwindling, which has been most serious in the northern part, resulting in some cases as high as forty per cent. shortage of winter stores, with the long continued cold and unfavorable weather was principally accountable for this state of things. During fruit and dandelion bloom the bees were badly handicapped on account of the bad weather.

In the south and west part of the district, the honey flow has been good, in many cases above the average. In the north, conditions obtained were not quite up to the average. Many of the small lots of bees kept by farmers in the parts that have been infected with foul brood have been completely wiped out, and the disease pretty well checked through the foul brood inspectors' visits to those sections. Bee-keepers are giving greater attention to the re-queening of their apiaries than formerly.

By Wm. Armstrong, District No. 8.

Bees came through the winter in very good condition, about 5 per cent. loss.

The greater part of the bees in this district are wintered outside in double-walled hives and winter cases packed with chaff and sawdust.

The bees that were wintered outside came through the spring and built up faster than the bees that were wintered in the cellars, and therefore were in better shape when the clover harvest opened. The honey crop was very good, some yards giving as high as 150 lbs. per colony clover honey. The average would be about 75 lbs. per colony for the district.

There is a great improvement in bee-keeping in this district the last two years; there is a very great demand for bees. The farmers are beginning to see the great benefit of having plenty of bees close to their alsike clover fields and their orchards. I have had a number of requests from farmers to move my bees to their clover fields, and they would find a place to set them, also a house to extract in, free of cost.

In every case where the bee-keeper looked well after every detail, and did the work at the proper time, they gave him good returns for his work. The largest crops of honey was where there was plenty of alsike clover.

By W. J. Craig, Brantford, District No. 9.

In regard to district No. 9, I would say that bee-keeping with us suffered a very serious setback in the seasons of 1905-7, from which it is but now rallying, and has not by any means regained its original proportion and conditions. The season of 1908, however, has brought a marked improvement in this. The increase in the number of colonies over last year will probably amount to over one-third, and the average yield 70 or 75 lbs. per colony. As a district, we can boast a goodly number of intelligent and progressive bee-keepers, though we have still a proportion of the commonplace,

where the bees are considered of little importance. There the bee-keeping is of a very crude character, indeed. It is with these latter that we have considerable difficulty, not only in connection with the marketing of the product, but, as our apiary inspectors have found, in the locating and treatment of disease. Brant County Association is providing for field and apiary meetings next season in an effort to improve these conditions. Apiaries as a whole are fairly free from foul brood, though occasionally an isolated case will crop up in some unknown and unexpected quarter.

I might also report a very successful district convention, held in the city of Brantford in January last, which we hope to repeat again next January, and would welcome any of our bee-keepers outside of this district who might attend.

By D. Chalmers, Poole, Division No. 10.

Bees mostly wintered well, but the spring was rather unfavorable up till about May 15th. From that date bees went off with a bound, prospects were promising in show of bloom, yet it proved to be of short duration in nearly every instance. The weather conditions were good in the early part of the season, but later turned out too dry. The result was a short crop in general. Some, however, were favored with a bountiful honey harvest.

The local trade was not so brisk as last year, caused no doubt through the heavy make of maple syrup last spring, and the abundance of small fruits marketed during the summer, so that there is yet a quantity of honey in the hands of some producers.

Wherever bees were within reach of golden rod, asters, fireweed, etc., during the fine fall weather they bred up well, and have an abundance of young bees and mostly honey enough for winter, and should come through in good shape.

By F. J. Miller, Ealing, District No. 11.

In our district the spring loss was again quite heavy. The crop was only moderate. Prices started low, the best comb honey selling at $1.50 per case, extracted at 9c., but prices gradually advanced until now $2 may be obtained for comb, and 11c. for extracted. The work of inspection has been more thoroughly accomplished than ever before. In Middlesex, we have the largest local association in the Province, having had the largest number of members last year of any of the affiliated societies, and feel certain that we will this year again head the list. Upon the whole, I am well pleased to report the work in our district as very favorable.

By Denis Nolan, District No. 12.

The winter of 1908 was rather favorable for wintering, but the spring was not so, and quite a heavy loss of bees was the result, almost as bad as that of 1907.

The honey flows were all fairly good, especially clover and buckwheat, the former yielding 50 to 60 lbs. in some localities, and basswood 10 lbs., with buckwheat ranging as high as 30 lbs. per colony.

During the past three years the bees have decreased to nearly half what there used to be, and the production of honey reduced in proportion. The local market was good, and honey retailed at 11c. to 14c. per lb., and the balance found a ready sale in the north and west.

The bees required less feed before going into winter quarters than usual, owing to the yield from buckwheat. The prospects are good for a yield from clover for the coming year, quite a large acreage being seeded.

BY-LAWS.

1. This Association shall be known as the Ontario Bee-Keepers' Association, and shall be composed of those interested in bee-keeping who become enrolled as members by paying the annual membership fee of one dollar, or as provided in Clause 19 of the Constitution.

2. A general meeting of the members of this Association shall be held once a year, and shall be known as the annual meeting, the year to begin with the election of officers at such annual meeting and terminate on the election of their successors at the next annual meeting. At this annual meeting, or any other general meeting of this Association, ten members in good standing shall constitute a quorum.

3. The place of holding the next annual meeting shall be fixed by the members present at the annual meeting.

4. The Board of Management shall consist of twelve directors, elected one from each of the following divisions:

Division No. 1.—Stormont, Dundas, Glengarry, Prescott and Cornwall.
Division No. 2.—Lanark, Renfrew, Carleton, Russell and Ottawa.
Division No. 3.—Frontenac, Kingston, Leeds, Grenville and Brockville.
Division No. 4.—Hastings, Addington, Lennox and Prince Edward.
Division No. 5.—Durham, Northumberland, Peterborough, Victoria and Haliburton.
Division No. 6.—York, Ontario, Peel, Cardwell and Toronto.
Division No. 7.—Wellington, Waterloo, Wentworth, Dufferin, Halton and Hamilton.
Division No. 8.—Lincoln, Niagara, Welland, Haldimand and Monck.
Division No. 9.—Elgin, Brant, Oxford and Norfolk.
Division No. 10.—Huron, Bruce, Grey and Perth.
Division No. 11.—Essex, Kent, Lambton, Middlesex and London.
Division No. 12.—Algoma, Simcoe, Muskoka, Parry Sound, Nipissing and Manitoulin.
Also one director from the Ontario Agricultural College and Experimental Farm.

5. No director shall hold office for more than five years. Retiring directors shall be eligible for re-election at the end of two years.

6. The Board of Management shall from among themselves, elect a President, and two Vice-Presidents.
They shall also appoint from among themselves, or otherwise, a Secretary and a Treasurer, and shall also appoint at least three of their number as an Executive Committee.

7. Five members of the board shall constitute a quorum.

8. Vacancies on the Board by death, resignation or non-acceptance of position, may be filled by the President, subject to the approval of the Executive Committee.

9. The officers of this Association shall be elected by ballot, with the exception of the auditor, who may be elected by an open vote of the Association.

10. It shall be the duty of the President to preside at all meetings of this Association; to call for reports; to put motions when seconded; to decide upon questions of order, and to declare the result of ballots and elections. The President, in connection with the Secretary, shall have power to call special meetings when necessary. The President shall be *ex-officio* chairman of the Board of Directors, and shall call it together when necessary.

11. In the event of the death or absence of the President, the Vice-President shall discharge his duties.

12. It shall be the duty of the Secretary to keep and preserve the books of the Association; to call the roll and read the minutes at every meeting of the Association; to conduct all correspondence of the Association; to receive and transfer all moneys received for fees and otherwise to the Treasurer, having taken a receipt for the same; to make out a statistical report for the Association and for the Government; to furnish the officers of the County and District Associations with forms for organization and annual reports and to give notice of Association and Board meetings through the press or otherwise.

13. It shall be the duty of the Treasurer to furnish such securities for the moneys of the Association as the Board may determine; to receive from the Secretary all moneys belonging to the Association, and to give receipts for the same; to pay them

out on order endorsed by the President and Secretary, and to render a written report of all receipts and disbursements at each annual meeting. He shall give security as provided by Clause 17 of the Act respecting Agricultural Associations.

14. Any County or District Bee-Keepers' Association in the Province of Ontario may become affiliated with this Association on payment of five dollars, which shall be paid to the Secretary on or before the first day of June in each year; but every local Association so affiliated must have on the membership roll at least ten members who are also members of the Ontario Bee-Keepers' Association at the time of its affiliation, and must continue to have a like number of its members on the roll of this Association while it remains in affiliation.

15. Every affiliated Association shall receive an annual grant out of the funds of this Association. The amount of such grant shall be fixed by the Board from year to year.

16. All grants to affiliated Associations shall be expended in prizes for honey shows, or for shows of apiarian appliances, or for lectures on subjects pertaining to bee culture, or for advertising district or county meetings, or for any or all of these, and for any other purpose not inconsistent with the objects of the Ontario Bee-Keepers' Association.

17. Every affiliated Association shall report to the Secretary of this Association (on a form to be supplied by the Secretary) ten days before the annual meeting of the Ontario Bee-Keepers' Association, which report shall be signed by the President and Secretary of the affiliated Associations.

18. County or District Associations seeking affiliation should forward to the Secretary an application according to the following form: "We, whose names are written in the accompanying form, having organized ourselves into a County (or District) Association, to be known as County (or District) Association No. —, desire to become affiliated to the Ontario Bee-Keepers' Association, and we agree to conform to the Constitution and By-laws of said Association.

19. Every affiliated Association that neglects or refuses to pay the annual affiliation fee, or neglects or refuses to forward to the Secretary the annual report on or before the date fixed, may be deprived of their affiliation privileges by the Board.

20. Should an affiliated Association become defunct after payment to it of the grant from this Association, any unexpended balance of said grant shall be forfeited and paid over to the Treasurer of this Association.

21. Membership fees of affiliated Associations shall be at least fifty cents. Any such members may become members of the Ontario Bee-Keepers' Association by paying an additional fifty cents to the Secretary of the affiliated Association, who shall forward said fee to the Secretary of the Ontario Bee-Keepers' Association.

22. Each affiliated Association shall be entitled to the services of an Association lecturer (when such exists) once in each year, half the expenses connected with such lecture to be borne by the District or County Association and half by this Association.

23. The order of business by which the meetings of this Association shall be governed shall be at the discretion of the President, but subject to appeal to the meeting when objection is taken, when a majority vote of the members present shall decide on the objection, and in such cases the vote of the majority shall be final.

24. These By-laws may be amended by a majority vote of the members present at any annual meeting, or at a special meeting of the members called for the purpose of considering the same, and of which at least two weeks' notice shall be given by public advertisement.

APPENDIX.

HONEY PRIZE LIST.

Ontario Horticultural Exhibition.

Section 1. 20 dozen comb honey in sections, 1st, Geo. Laing, Toronto; 2nd, D. Anguish, Lambeth; 3rd, F. W. Krouse, Guelph.

Section 2. 5 dozen comb honey in sections, 1st, F. W. Krouse, Guelph; 2nd, D. Anguish; 3rd, Geo. Laing; 4th J. H. Thomson, Britannia.

Section 3. 1 dozen comb honey in sections, 1st, Geo. Laing; 2nd, D. Anguish; 3rd, F. W. Krouse.

Section 4. 200 lbs. extracted liquid honey, 100 lbs. in glass, balance in tins; 1st, Mrs. D. Anguish, Lambeth; 2nd, Geo. Laing; 3rd, H. G. Sibbald, Claude.

Section 5. 50 lbs. extracted liquid honey in glass; 1st, Mrs. D. Anguish; 2nd, Geo. Laing; 3rd, Jno. Timbers, Cherrywood.

Section 6. 10 lbs. extracted liquid clover honey in glass, 1st, Jno. Timbers, Cherrywood; 2nd, H. G. Sibbald; 3rd, Geo. Laing; 4th, Mrs. D. Anguish.

Section 7. 10 lbs. extracted liquid honey in glass, 1st, R. F. Holtermann; 2nd, J. H. Thomson; 3rd, Mrs. D. Anguish, 4th, Geo. Laing.

Section 8. 50 lbs. extracted granulated honey, 1st, Geo. Laing; 2nd, J. H. Thomson; 3rd, Mrs. D. Anguish; 4th, F. W. Krouse.

Section 9. Display, 200 lbs. (suitable for grocer's window), 1st, Geo. Laing; 2nd, D. Anguish; 3rd, F. W. Krouse.

Section 10. 25 lbs. extracted buckwheat honey, 1st, F. W. Krouse; 2nd, R. F. Holtermann; 3rd, Jno. Timbers, 4th, Geo. Laing.

Section 11. 2 dozen buckwheat honey in sections; 1st, Geo. Laing; 2nd, Mrs. D. Anguish.

Section 12. 10 lbs. beeswax, 1st, Geo. Laing; 2nd, M. B. Trevorrow; 3rd, R. F. Holtermann.

Section 13. 6 articles containing honey for domestic purposes: 1st, Mrs. D. Anguish; 2nd, Geo. Laing; 3rd, Mrs. J. W. Sparling; 4th, J. H. Thomson.

Section 14. New invention for bee-keepers; 1st, R. F. Whiteside; 2nd, J. H. Thomson; 3rd, Geo. Laing; 4th, S. P. Cubitt.

Section 15. Display of bees with Queen; 1st, Geo. Laing; 2nd, F. W. Krouse.

Section 16. Method of crating and packing comb honey, showing 12 sections cases ready for shipment; 1st, J. H. Thomson; 2nd, Geo. Laing; 3rd, D. Anguish.

Section 17. Packages for shipping extracted honey, showing method, 1st J. H. Thomson; 2nd, Geo. Laing; 3rd, D. Anguish.

Section 18. Packages for retailing extracted granulated honey, filled; 1st, Geo. Laing; 2nd, J. H. Thomson; 3rd, Mrs. D. Anguish.

ANNUAL REPORTS

OF THE

Dairymen's Associations

OF THE

PROVINCE OF ONTARIO

1908

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1909

WARWICK BRO'S & RUTTER, Limited, Printers
TORONTO.

To the Honourable JOHN MORISON GIBSON, K.C., LL.D., *etc., etc., etc.,*
Lieutenant-Governor of the Province of Ontario.

May it Please your Honour:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Dairymen's Association of Western Ontario for 1908, and the Report of the Dairymen's Association of Eastern Ontario for 1908.

Respectfully submitted,

JAMES S. DUFF,
Minister of Agriculture.

Toronto, 1909.

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OFFICERS FOR 1909.

Dairymen's Association of Eastern Ontario.

Hon. President.....Hon. D. Derbyshire, Brockville.
President.....J. R. Dargavel, M.P.P., Elgin.
1st Vice-President.....Henry Glendinning, Manilla.
2nd Vice-President.....J. H. Singleton, Smith's Falls.
Secretary.....R. G. Murphy, Brockville.
Treasurer.....J. R. Anderson, Mountain View.

Directors.

John H. Singleton.....Smith's Falls.
Neil Fraser.....Vankleek Hill.
Edward Kidd.....North Gower.
Napoleon Longtin.....The Brook.
John McGregor.....Alexandria.
Peter McDermid.....Avonmore.
C. F. Whittaker.....Williamsburg.
James A. Sanderson.....Kemptville.
John R. Dargavel, M.P.P., Elgin.
Hon. D. Derbyshire...Brockville.
T. A. Thompson.....Almonte.
Joseph McGrath.....Mount Chesney.
W. J. Paul, M.P.P ....Tamworth.
James Whitton..... Wellman's Corners.
Alex. Hume.....Menie.
G. A. Gillespie.....Peterborough.
Henry Glendinning...Manilla.
Alex. S. White.....Sidney Crossing.

Association Auditor.....John Hyatt, West Lake.

Dairymen's Association of Western Ontario.

President.—J. J. Parsons, Jarvis.
1st Vice-President.—Jno. H. Scott, Exeter.
2nd Vice-President.—Wm. Waddell, Kerwood.
3rd Vice-President.—D. A. Dempsey, Stratford.
Secretary-Treasurer.—Frank Herns, London.

Directors.

J. N. Paget, Canboro.
S. R. Wallace, Burgessville.
S. E. Facey, Harrietsville.
Geo. M. McKenzie, Ingersoll.
J. B. Smith, Alton.
W. S. Stocks, Britton.

Auditors.

J. A. Nelles, London.
J. C. Hegler, Ingersoll.

Representative to Canadian National Exhibition, Toronto.—Robt. Johnston, Woodstock.

Representative to Western Fair, London.—I W Steinhoff, Stratford.

DAIRY INSTRUCTORS AND SANITARY INSPECTORS, 1909.

EASTERN ONTARIO.

G. G. PUBLOW, Chief Instructor, Kingston.

J. F. SINGLETON (Kingston), Instructor in Creameries in Western section and Assistant to Chief Instructor in Cheese Factory Work.

Group.	Cheese Instructors.
Napanee	Geo. Bensley, Napanee.
Kingston	H. Brintnell, 133 Alfred St., Kingston.
Cornwall	J. Buro, Mille Roches.
Lindsay	D. J. Cameron, Campbellcroft.
Plantagenet	Jos. Charbonneau, Plantagenet.
Brockville, W	S. S. Cheetham, Gananoque.
Ottawa	W. W. Dool, 117 Cooper St., Ottawa.
Perth	J. H. Echlin, Balderson.
Chesterville	T. J. Ellis, Chesterville.
Ottawa, W	R. E. Elliott, Carp.
Kemptville	W. G. Gardiner, Kemptville.
Vankleek Hill	W. G. Graham, Vankleek Hill.
Campbellford	R. T. Gray, Marmora.
Belleville	Hugh Howey, Belleville.
Finch	C. B. Larry, Finch.
Madoc	J. B. Lowery, Frankford.
Alexandria	A. McDonell, Box 30, Alexandria.
Brockville, N	P. Nolan, Philipsville.
Morrisburg	C. W. Norval, Williamsburg.
Picton	T. E. Whattam, Picton.
Almonte	W. J. Ragsdale, Smith's Falls.
Ottawa, E	Isaac Villeneuve, Casselman.
Peterborough	R. W. Ward, Foxboro'.
Brockville, E	A. H. Wilson, Athens

WESTERN ONTARIO.

FRANK HERNS, Chief Instructor, London.

FRED DEAN, Guelph,
MACK ROBERTSON, St. Marys. } Creamery Instructors and Sanitary Inspectors.

Group.	Cheese Instructors.
Listowel	Jas. R. Burgess, Listowel.
London	Arthur E. Gracey, Dorchester.
Brantford	R. H. Green. Cayuga.
Ingersoll and Woodstock	E. N. Hart, Ingersoll.
Stratford	Alex. McKay, St. Marys.
Simcoe	Geo. Travis, Tillsonburg.

FINANCIAL STATEMENTS.

DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO.

Receipts.

Balance from audit of 1907	$ 849 37
Ontario Government grant	2,000 00
Prince Edward County grant	300 00
Town of Picton grant	200 00
Miscellaneous grants	45 00
Borrowed from bank	500 00
Windsor Salt Co.	50 00
Cash from advertisers	235 00
Fines	1,175 07
Total	$5,354 44

Expenditure.

Annual Convention:	
Expenses of officers and directors	$ 400 00
Clerical assistance	50 00
Reporting convention	110 00
Rent of buildings	175 00
Paid for talent for entertainment	40 00
Expenses of local men	25 41
Advertising	148 85
Miscellaneous	38 40
Executive Meetings:	
Expenses of officers and directors	466 00
District Meetings:	
Services and expenses of speakers	625 15
Advertising	79 20
Rent of halls	15 00
Salaries of officers (Secretary, $300; Treasurer, $100)	400 00
Services of Auditor	25 00
Postage, stationery and express	143 90
Programmes and printing	153 75
Dairy Farm Competition (prizes)	50 00
Official prosecutor	1,098 23
Subscription for stock in *Canadian Dairyman and Farming World*	450 00
Repaid loan from bank	500 00
Bank charges on cheques	5 70
Miscellaneous	127 75
Balance in bank	227 10
	$5,354 44

DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO.

Receipts.

Cash on hand from previous report	$1,417 72
Members' fees	347 00
Legislative grant	2,000 00
Money received from prosecutions	920 00
Sale of exhibits	1,594 60
Advertising in program	150 00
Total	$6,429 32

Expenditure.

Cash paid for prizes	$360 00
Expenses for conventions or regular meetings	140 30
Stenographers' salary, $420.00; directors' fees and expenses, $203.55	623 55
Postage and stationery, $147.82; printing, $186.38; advertising, $130.96	465 16
Judges' expenses, $20.00; lecturers' expenses, $215.45	235 45
Inspectors' salaries, $435.00; other expenses of inspectors, $191.58	626 58
Periodicals for members	234 80
Cost of reporting	75 00
Refund to member, $1.00; office furniture, 21.45	22 45
Purchase of exhibits	1,620 90
Office light, cleaning, sundries	62 71
Office rent, $120.00; auditors' fees, $13.00	133 00
Telephone and telegraph, $85.98; express and storage, $15.60	101 58
Half fine paid to factories	460 00
6th, 7th, 8th and 9th call on stock, *Canadian Dairyman and Farming World.*	400 00
Balance on hand January 2, 1909	867 84
Total	$6,429 32

Dairymen's Association of Eastern Ontario.

ANNUAL MEETING.

The thirty-second Annual Convention of the Dairymen's Association of Eastern Ontario was held in the town of Prescott, on January 6th, 7th and 8th, 1909.

In spite of the fact that it had rained in torrents the night before, and that the sleighing had disappeared, there was a good attendance at the opening session, which began at 10.30 a.m. In the absence of the mayor, the chair was taken by Dr. Reid, M.P.

PRESIDENT'S ADDRESS.

By John R. Dargavel, M.L.A., Elgin.

I have no apologies to make for appearing before you to-day to open this Dairymen's Convention in Prescott, which, I hope, will be as great a success, as any which have preceded it.

Your town sent representatives, in the persons of Messrs. Evanson and Elliott, to wait upon our executive committee and ask for the holding of this Convention in Prescott, and notwithstanding the fact that other towns were represented at that meeting, these gentlemen urged their claims so strongly and overcame every objection which was raised against it with such convincing arguments, that an unanimous vote said "Prescott for the next place of meeting."

I am very much pleased to learn from our secretary that at no other town or city has he met with more encouragement and a desire to make this Convention a success than has been shown by the people of this historic town of Prescott. I desire on behalf of the board of directors to thank you for the kind reception extended to us, and for the kind assistance given by your local committee and others to our secretary in making the usual preliminary arrangements for this meeting.

In looking over the year just closed and summing up the output of the dairy products of Canada we again find a marked falling off of the exports of cheese, but an increase in the output of butter.

The aggregate value of Canadian cheese and butter exports for the season just ended was approximately $18,987,340 as compared with $20,186,398 for 1907, a decrease of $1,999,058; but if we make comparison with 1906, which amounted to $25,999,034, this season's returns would show a decrease of no less than $7,011,694.

This review has to do with the exports only, but as was pointed out by J. A. Ruddick, Dairy Commissioner, in a statement which he made before the Select Committee of Agriculture, at the last session of Parliament, this cannot be taken as a correct basis upon which to estimate the amount of money derived from the manufacture of butter and cheese in Canada. While the growth of the population was small this might answer, but with increased immigration we have had a rapid increase of home consumption, which we

must not overlook. That there was less cheese made in Eastern Ontario than in the year previous goes without saying, and an enquiry as to the cause might be in order. Owing to extreme dry weather during the summer of 1907, many farmers found themselves short of feed to get their cattle through the winter of 1907-08 and thousands of milch cows were sold for almost nothing to reduce the number for which feed must be produced. This was, without doubt, one of the things which contributed to the short make. The shortage of feed in the spring of 1908, and a drouth during the summer following, caused the farmers to buy considerable feed. In consequence, less revenue was derived from their dairy business, although the prices ruled slightly higher during the year of 1908 than in any of the previous years; but the farmer is slowly learning the lesson of the necessity of better cows, better farming, more feed, and cheaper production, and I am going to predict that, if not in the season just ahead of us, the near future will see us not only making a quantity as great as in the years of our largest make of cheese in Canada, but to years of larger make than Canada has ever known.

The Province of Ontario has 1,096 cheese factories, 86 combined butter and cheese factories and 102 creameries, making a total of 1,284 factories. The products of these factories play an important part in the progress and prosperity of the Province, being one of the chief sources of income and profit of the farming community.

It is not too much to say that the superior quality of our cheese has had much to do with the increased demand for our goods in England. The English consumer likes a good article, and we have been able to largely satisfy his fastidious taste and secure his trade; but there is still room for improvement, and we must strive for better things, if we are to hold our own in the English market, which is open to the competition of the world. We should, I think, congratulate ourselves, that we have been able to build up such a large and profitable trade, which I hope and believe will see a greater expansion in the years to come. But we must not stand still, as there is much yet to be done. Not long since a Scottish Agricultural Commissioner on his return home to the Old Country from a visit of inspection of dairying in Canada, stated that, "the stables in which some Canadian cows are kept are not as clean as they ought to be," and he coupled with this suggestion that something should be done to induce the Imperial Government to see that the Canadian authorities enforced a system of inspection in the Dominion of Canada as rigorous as that applying to dairying in the "Old Country." Does this not look like a danger signal? I must confess that I believe this Scottish agriculturist has cause to make this statement and my belief is founded on personal knowledge of the condition of some stables I, myself, have seen. To my mind, it behooves us to bestir ourselves in the direction of meeting in advance any objections which may be urged against our methods.

As president of this Eastern Ontario Dairymen's Association, perhaps I should not boast of what it has achieved in promoting the dairy interests of this Province, but a modest reference to its work may be mentioned. Does any person present think that the bringing in of 200 cheese factories two years ago to receive instruction and sanitary inspection which they had not been receiving before would have been accomplished if there had been no Dairymen's Association to discuss this situation and urge its necessity upon the Government through some of its members? I say no, emphatically no.

When I, as your president, asked the Government to take off the fee of $15 from factories for instruction which meant about $15,000 to the farmers, does any person suppose this would have been done and this saving effected for the dairymen if no Dairymen's Association were speaking through me? I think not.

Do you think the "Milk, Cheese and Butter Act," which was assented to on the 14th April last would have been enacted if there was no Dairymen's Association to show the necessity of this kind of legislation? I think not.

Do you think that the factory owners and patrons would to-day stand relieved from the prosecution of the offenders of this Act, if there had been no Dairymen's Association to step in and appoint two competent men and pay the entire cost of their services to do this work for you for the year just passed? I think not.

Do you think that the special dairy meetings would have been held in your various counties, at your very doors, and competent men sent to talk upon dairy topics specially, if there were no Dairymen's Association to urge the neccessity of so doing and pay the cost of them? I think not.

But, gentlemen, I am proud to be able to say that such an organization does exist. To those who think this Association has lost its usefulness, I would say, that if there is no other reason alone than the fact that it has been, and is now, the connecting link between the dairymen and the Government you could not afford to do without it. You cannot afford to barter away the organized effort which this Association has ...sed for the upbuilding of this industry for the individual effort of any one man. I can assure you that none of the things I have herein mentioned as having been accomplished has been brought about by individual effort alone, but by a union of thought and effort brought about by the exchange of ideas among the members of our board of directors and at conventions such as this. If it be true, that there is yet room for improvement in the production of our dairy products, would it be wise to bring about the extinction of this and kindred associations? I think not.

I assure you that in the future as in the past I shall in my place on the floor of the House at Toronto give special attention to all legislation, which will in any way affect your interests, and I shall do all in my power to further the interests of dairying in all its branches, but my efforts in your behalf would be much weakened were it not for the fact that the Eastern Ontario Dairymen's Association, as an organized body, is behind me.

As I shall preside over the various sessions of this Convention, and will have opportunities of saying something further, from time to time, if necessary I shall not prolong these opening remarks; but before closing, I want on behalf of myself and this Association to thank the Hon. Nelson Monteith (recently resigned) for his extreme kindness and liberality to us during his term of office as Minister of Agriculture, and to extend a welcome to the Hon. James S. Duff, the new Minister, who has recently accepted the position. I feel sure from personal knowledge that the cause of the dairymen of this Province will not suffer at the hands of the new Minister of Agriculture and I am pleased to know he will be with us and address us on this occasion.

I also wish on behalf of the Association to tender thanks to the Hon. Sydney Fisher, at Ottawa, and the Dairy Commissioner, J. A. Ruddick, for the valuable assistance we have received from them in various ways; and as President of this Association speaking to the dairymen of Grenville, I would be ungrateful did I not acknowledge the assistance and co-operation invariably received at Toronto from your talented representive, G. H. Ferguson, M.P.P., in my humble efforts to promote through the Government the interests of the farmers and dairymen of Eastern Ontario. We expect to have all these gentlemen with us as well as many others whose names are well known to you to address the several meetings, and I sincerely hope every effort

will be put forth by those who attend to co-operate in making this Convention a success.

The CHAIRMAN: The address your President has just given is very interesting, and I am sure the result of this Convention is going to be of great use to the farmers of this section.

We are glad to welcome you here, and I have much pleasure in asking our good old friend, Senator Derbyshire, to give a short address. We all like to see him here. I remember the first dairy meeting that I ever attended was in this hall, and the speech that I heard from Senator Derbyshire at that time, I thought was very interesting, and one that every farmer in the Dominion of Canada should hear. I certainly gained a great deal of information that was useful to me in my little way of farming.

THE DAIRY OUTLOOK IN EASTERN ONTARIO.

By Senator D. Derbyshire, Brockville.

I am delighted, Mr. Chairman, to see you occupying the position of chairman and identifying yourself with the dairymen of this great old County of Grenville. It is a great honour for you to represent this particular part of the country in the Dominion House, representing as you do some of the live Canadian dairymen of this section, as good as there are anywhere in the Dominion.

We feel proud of what we have been able to accomplish in this Eastern section, and although the exports are not as much as we would like to see them, yet we have the satisfaction of knowing that in this district we have sold this year $3,000,000 worth of cheese. Not only that, but we have supplied the local market with a large quantity of butter and cheese. I am delighted to be in Prescott, because I have looked forward with a great deal of pleasure to meeting here. I would have liked to have had the meeting in Brockville, but the Prescott men were determined to have the meeting here, and, from the reception we have received, I am delighted we accepted the situation.

Last night's reception of the committee was the best we have ever had in the Dominion. You have right in your town an institution that many of the people do not know about. You have a creamery that is making fancy butter, and I am proud to see that it is extending from year to year. I find that in 1906, when they started that the milk delivery was valued at $11,220.18, and that is quite a large sum for the opening of a large institution with cheese factories in the immediate vicinity. In 1907, it was $11,757, and although this last year has been a trying one, in 1908 it amounted to $17,740—that is money paid out for milk delivered here, and I think it is a big record, for it is an increase of over $6,000. I can testify that the butter is fancy and of the finest quality.

I would like to congratulate our President on the able address he has just delivered. If there is any man who has served this Association well, it is John R. Dargavel, and he has served us well from the time that I appointed him treasurer *pro tem*, on the death of our old esteemed treasurer, Mr. Daly. I knew he would do the business right. I knew we would have a large deficit that year, and I though it best to have a good man to pay out the money even if he had to raise $2,300 on his own account. (Laughter.) Of course, that was a small matter with him, but with some treasurers it would interfere with their business. He helped us at that time, when we were hard up, and we

feel proud of the work he has done ever since. We had a selfish idea in making him the President. There was not a Minister of Agriculture that ever occupied the position that could argue for one minute why school children have free education and why the farmer should not have free education. I remember meeting Mr. Dryden, the Minister of Agriculture, and Mr. Ross, and they said, "We cannot afford to grant that money," and I admit it was a large sum at that stage. Then we elected Mr. Dargavel, President, and he went to Toronto, backed up by a committee of this Association, and waited upon the Minister, and they presented our claims for free education, and you all know that we got a grant from the Government of $4,000; and then we raised $12,000 ourselves and we hired instructors and paid them. When we had Mr. Dargavel on the floor of the House of Parliament, and with the Provincial Treasurer representing one of the dairy sections, we were granted $15,000 to give us free education, and that has lifted the dairy business straight up, and done more for it than anything we have had. We feel proud of the work Mr. Dargavel has done, not only this last year, but in the years that have gone before.

I was very glad that our President mentioned our good friend, the Hon. Mr. Monteith, because it was he who assumed the responsibility and presented this matter before the House and carried it through, and although he was defeated in the last election, and is not Minister of Agriculture to-day, I think it is only fair and proper that we should remember his name as one who has assisted the Eastern Dairymen and the agriculturists of Ontario possibly more than any one of the previous Ministers. We look forward to the new Minister being a practical man.

At one of our district meetings at Belleville, we had a large attendance, and they tendered us a banquet at the Quinte Hotel, and it was the best banquet I have had the pleasure of attending for many years. The new Minister of Agriculture, Hon. Mr. Duff was there, and his address had the right ring in it, and with our President on the floor of the House, I believe we will be able to show him the claims of the dairymen, and we have the best hopes that Mr. Duff will follow in Mr. Monteith's footsteps.

We are proud of the Deputy Minister of Agriculture, Mr. James. He has always been ready to assist and co-operate with the Eastern Dairymen, and we are glad he is going to be with us and assist us in the years to come, and Mr. Putnam, who has charge of Dairy Education and Farmer's Institutes has helped us all he possibly could, and we feel very thankful to him for the service rendered.

The greatest man connected with dairying in Eastern Ontario to my mind is Mr. Publow, Superintendent of the Kingston Dairy School. He has devoted his services enthusiastically to the dairymen of Eastern Ontario, and there is no man who deserves greater credit than Mr. Publow in connection with extending the business of dairying in Eastern Ontario. He has had charge of the twenty-four instructors, and is an authority in connection with this business in the Dominion of Canada and the United States. During the course of this year we felt very shaky about Mr. Publow. He was offered a great deal more money than we have been able to pay him, but with the influence of the President and the directors, we have been able to induce him to stay here until he sees his work perfected, and we feel proud that he accepted our suggestion.

Where cheesemakers attend the dairy schools at Kingston, we notice their cheese are cleaner and more uniform in size, and have better finish and are put up in better shape on account of the attention they receive at that institution.

The Dominion Government has done every thing they have been asked. They have improved the cold storage facilities, have given us a larger number and a better system of refrigerator cars on the railroads, and they have increased the number of ships leaving Montreal with cold storage facilities, and thus we have been able to deliver our goods on the British market in better condition than we ever did before, and we feel proud of what we have been able to do. They have better cold storage facilities on the docks on the other side. We remember very well when the butter was spoiled on the docks in the old Land by being allowed to stand, in some cases, three or four days in the sun. But to-day things are different. This has been brought about by the Dominion Government in sending men to the other side to watch the goods on arrival and take the temperature of the cold storage department on the ships, and the temperature of the produce, and report to the Dairy Commissioner. We have men in Montreal to watch the temperature of the cars to see that the goods are delivered on the railways in proper shape, and we feel thankful to the Minister of Agriculture for helping us in this way.

Everyone knows we have a fast friend in Mr. Ruddick, who has been an advocate of advanced dairying and cold storage for a good many years, and who has given valuable assistance to the dairymen of the Dominion in connection with this work.

He has visited the various centres of the world and kept in touch with dairying, and in this country has been able to give us very valuable assistance.

Mr. Whitley, one of the members of the Dairymen's Commissioner's staff, has rendered valuable services, and the great wonder to me has been that people have not taken the advantage of cow testing that is furnished free by a man who understands his business. I am sure that as the people find out the importance of the work he is carrying on they will avail themselves of these testing associations.

We also have with us Mr. Barr, one of the Commissioners under Mr. Ruddick, and his services have been invaluable. He has been making the test in different sections of Eastern Ontario and throughout the Dominion, finding out all he could about moisture and temperature and seeing that there was something that could be given to the dairymen that would be a benefit to them.

These men have all been at our command, and we have taken advantage of that fact, and we feel sure that the dairymen of Eastern Ontario are in better shape than they ever were before.

Twenty meetings were held under the direction of the Eastern Dairymen's Association during the past year and they were all largely attended. At the meeting held in the city of Belleville, over 300 sat down to the banquet, and the leading men of the vicinity were there.

One weak point, so far as our judgment is concerned, in connection with our dairy work is the cultivation of the soil in the growing of a larger and better crop, so as to have feed every day of the year to feed our cows in order to make them produce twice the quantity of milk. Give the cow plenty of good feed and plenty of water.

Our weakest point is the man on the farm. Why should so much money be paid out for feed when we have the best dairy section in Canada? We ought to grow plenty of feed to take care of the cows. Over $300,000 was paid out in Leeds and Grenville for feed for cattle; that ought to have been grown on the farm, and then we would have $300,000 more money in this County. The same thing occurred in the Kingston district and the Belleville District. We never raised as much corn before, as we did this year in our county, and it looks as if we are going to be able to produce milk at

less cost; but we must get the farmers to cultivate the soil more intensely and to raise twice the feed they are raising, and to feed the cows every day and never let them go hungry.

Never in the history of Canada has milk been worth more than it is to day. Why do not they milk the cows ten months in the year? The City of Toronto is sending fifty and sixty miles for milk, and when they become better acquainted with milk it will be consumed more largely. We took some pains, through Mr. Ruddick's department, to get some figures, and we find that the exports of butter, cheese, and bacon last year was $46,500,000. These goods were sent out of Canada and the money received here, and $53,500,000 worth of produce was consumed in this country.

With the large population coming into Canada, there is no doubt that the consumption of milk will be larger from year to year. We must have better cows, better stables and keep them scrupulously clean. See that your factory is properly fitted up, see that they have ice, and see that you have ice on every farm for the purpose of keeping the milk cool. You can make ice bricks on your own farms by putting the water in pans and letting it freeze. Every factory ought to have a store of ice in order to keep the temperature right. We are anxious that you should co-operate with us in placing this dairy business on a higher plane.

COMMITTEES.

The following committees were then appointed:

Resolutions: R. G. Murphy, T. A. Thompson and J. H. Singleton.

Legislation: John McGregor, G. G. Publow, R. G. Murphy, Senator Derbyshire and J. R. Dargavel, M.P.P.

Nominations: James Whitton, Senator Derbyshire, and Henry Glendenning.

Business: J. A. Anderson, W. J. Paul, M.P.P., J. H. Singleton, T. A. Thompson, and E. Kidd.

ADDRESSES OF WELCOME.

Mr. Louis H. Daniels, Mayor of Prescott, gave a most hearty welcome to the members composing the Convention. He then went on to say:

I assure you it affords me much pleasure to have the honor of speaking to you for a moment or two on this broad subject upon which we have been called together, a subject of greater importance than any other industry in Canada, that of the science and production of making butter and cheese. It equals in value any other product in Canada, and I think much excels the wheat from the great Northwest. It was my good fortune to be a visitor at the Centennial Fair held in Philadelphia in 1876, and I think, Mr. President, you were there also. Canada made a great exhibit of her products at that fair. However, it was not there that Canada derived her great fame as a butter and cheese producing country, but when we reached the World's Fair in Chicago and we showed that great cheese which was presented to the people of the world and which was made in Canada, and within fifty miles of our town, weighing one ton. It was a great advertisement for Canada. (Applause). I had the pleasure of sampling it, and it was the very best cheese, and it was then that the mantle of glory was lifted, and Canada was

proclaimed one of the greatest butter and cheese producing countries in the world. I could talk along lines of butter and cheese making and the bringing to perfection of that famous animal, the cow, but it is not necessary, because we have on the platform gentlemen who are versed in these matters and can explain the matter more accurately than I can. Allow me to extend the right hand of fellowship to each and every one of you on behalf of the citizens of Prescott, and we will try to make you all feel at home and as happy as we know how.

Mr. W. P. McCarthy, President of the Board of Trade: On behalf of the Board of Trade of the town of Prescott, we extend you a cordial welcome to our town. The members of the Board of Trade enjoy more benefit from the Dairymen's Association than do any other branch of the citizens of the town. The sum of $3,000,000 has been left in the counties of Grenville and Leeds during the past year for dairy productions. The business people of this town, and of the town of Brockville, have enjoyed the biggest part of that, and we hope your thirty-second Convention will be the greatest you have ever held in Canada, and that the benefits derived will be of great advantage not only to the dairyman but to the country at large.

The dairying industry is the greatest we have in Canada to-day. Every cent derived from it is spent in the country. The railroads and the great industrial bodies go to the Old Country to borrow money, and this has to be repaid in due time. But the dairymen sends cheese over there and brings back to Canada money that is spent here, and that will never have to go back. We find a great many Americans coming over here asking for good old Canadian cheese, for the quality of Canadian cheese is the best in America. Our reputation has always been sustained, and we hope that it always will be the case. We trust that your visit here will be a pleasant one and of advantage, and will add to your prosperity next year. This is your first visit to our town, and we hope it will not be your last.

Senator Derbyshire, in his most genial manner, made a suitable reply to the kind words of welcome.

THE WORK OF THE COW TESTING ASSOCIATIONS.

Mr. C. F. Whitley, of the Dairy Division, Ottawa, gave an address on the above subject, similar to that appearing in the report of the Western Dairymen's Association.

Mr. Derbyshire: I went to a factory and attended their oyster supper. After it was over I looked over their books. I went to the man that had the best yield per cow in the factory, and then I got the second best man. Finally I went to the smallest man in the factory, and asked him what his ideas were. He was getting only $16 or $17 per cow, and I said to him: "How is business this year?" He said, "We are getting fine prices." The blessed fellow was not getting enough to pay for the feed of his cows, yet he was happy on account of the price being high. We put these three men's names on the black-board; one was getting $67 per cow, the other $40 and the other $17, and that was a lesson for the people of that district. We must weed out the poor unprofitable cows and keep good ones, and the only way to do it is by weighing and testing their milk. This address Mr. Whitley has given us is a most important one, and I hope it will sink into the hearts of all here and that you will put it into operation.

The Chairman: I would like to relate a little experience I had in a factory I was running, because it bears out exactly what Mr. Whitley has said. None of the patrons were feeding their cattle anything extra, and they were not buying any feed, therefore that could not be urged as a reason why one patron was getting a larger return than another. I quietly found out from each patron how many cows they had. I got correct figures in every instance. I got the man who had the best average per cow in that factory. It was not very large, it was only about 4,000 pounds. Then I went to work and made the calculation as to how much more each one of the other patrons would have received if they had sent even as much per cow as the largest sender, and I found that some would have received $10 more, others $30, $40 and as high as $100 and $200 more, until it ran up to one man who would have got $400 more that season out of that factory if he had obtained as much per cow as the largest. I submitted these figures to the patrons and they were all pretty mad; they didn't like it a bit. It should have been a useful lesson to them, and I think it would be to other patrons in this Province. I think we should point out to them how much more they would receive if they only came up to the best man in the factory.

A Member: Mr. Whitley spoke of a herd of cows that gave somewhere like 4,000 pounds per head in two years, then they afterwards gave 6,000 pounds per head, and he said that was done through the work of the Cow Testing Association. I would like to ask how it was done. It could not be done by breeding in two years, and it must have been done by feeding, if the man kept the same number of cows.

Mr. Whitley: As Prof. Dean has often said, it is a question of feeding, weeding and breeding. The average is very quickly raised if the ones at the low end are got rid of. You will find it in the columns of nearly every agricultural pamphlet every week, "Get rid of the small producing cows, and feed the others a little better."

A Member: Did he keep up the number of his herd?

Mr. Whitley: I am not sure on that point.

A Member: A man may get rid of his poor cows and milk fewer cows, and keep them better, and make just as much money and have greater profit.

Mr. Whitley: That man has done it and so have scores of others. I had a case were a man doubled his yield by better feeding; he doubled his production with the same cows.

A Member: Where did these Cow Testing Associations originate? Did they spring from our Dairymen's Associations?

Mr. Whitley: The first one in Canada was organized in Cowansville, Quebec, and the first one in Ontario was in Senator Derbyshire's own district, Brockville.

A Member: If the Dairymen's Associations brought this about, I think it is a good thing for the country. The man in my factory who is sending the most milk is the man that is weighing his milk from each cow, and trying to find out what each cow is giving.

PROBLEMS OF DAIRYING.

By G. A. Putman, Director of Dairying, Toronto.

It may be that some of you can judge from the subject which has been announced for me that my intention is to bring trouble before you. I think you will all admit that dairymen have troubles of their own, and that per-

haps it is not necessary for us to point them out. We are not here to-day to seek for further trouble, but to draw attention to some of the conditions which we find in Ontario. These conditions have been forcibly impressed upon me in my work of Dairy Director, and Superintendent of Farmers' Institutes, and it is my purpose to lay before you in rather an informal way some of the conditions which we find and to point out, if possible, some of the more important needs of the industry.

I suppose we can mention some problems and troubles which are not evident to the great body of dairymen, but we will mention only those which are apparent to all of us. I think we will all admit there has been progress all along the line in dairying matters during the past three or four years. Our oldest organization for giving information to the farmers is our Farmers' Institutes. We are now sending men to attend factory meetings, and in that way we have reached a great many farmers that we could not get hold of through the Institute meetings We are glad that they have shown appreciation of the work of the Department, and of the Association, in sending out speakers to these annual meetings. We would like to impress upon farmers the necessity of coming together at the annual meetings, discussing problems, and dealing with local conditions in a business like way. We think it is well for you to have the sub-conventions to deal with the problems of different localities, and this has been done very effectively. Last year we distributed 60,000 leaflets on the care of milk, and we have sent instructors to the factories, whose duty it was to help the factory men in methods of manufacturing. We have also sent out literature to the different makers in the Province. These things have resulted in better sanitary conditions, which, after all, is the underlying necessity in connection with dairying. A number of factories have been induced to make better provision for the cool-curing of their cheese. Farmers also, are growing a larger amount of fodder for their cattle, and endeavouring to maintain the flow of milk throughout the season, and they have also been induced to take better care of their milk. The chief instructor informs me that there has been more progress in the proper care of milk during the past two or three years than in the previous eight or ten years, and the makers are better equipped, even though they have not gone to the dairy schools in such large numbers as they should.

The farmer has the trouble of production to face. In some localities of Eastern Ontario the average production per cow is about 2,500 pounds of milk during the factory season. That means that the average production is hardly above the profit point, and it also means that a great many of the cows are being kept at a direct loss to the farmer. We have a great many good cows that are producing a large flow of milk, but we have so many poor producers that it is a question that should receive the immediate attention of the farming community.

In a certain district in the Province there were ten herds of cattle. One of these herds was making a certain profit, and the other nine were making a certain profit, but the one herd was making more profit than the other nine put together; in fact, one man was making as much money out of his eight cows as the other nine were making out of their seventy-two. The farmers seem to forget that it is profit they are working for and not gross returns. Of course the nine men were receiving more money, but they were only making the same profit from their seventy-two cows as the one man was making from his eight cows. That is a matter in which you must work out your own salvation.

The proprietors of factories certainly have a difficult problem to solve. There are so many small factories in Eastern Ontario that the dairy industry can never be placed on a business basis until some method is adopted by which these small factories can be wiped out and larger factories erected. The factory that can afford to pay a maker a reasonable wage so as to induce bright men to enter the business is going to be the most benefit to this industry; and if the manufacturers are going to work upon a business basis they must have good makers, and they must have conditions that will induce the right sort of men to enter the business. We must get rid of the idea of looking on the profit for one year, and we must establish the business on a permanent basis.

The makers also have problems to solve, and the cheese-making profession must be given a higher standing than it has to-day, and that rests with the makers themselves. If the makers properly equip themselves for the work they can demand and they can get a fair remuneration for the energy they put into their work. If permanency is to be given to the industry, we must have united action on the part of the proprietor, the maker and the producer. What is the necessity of the one makes for the advancement of the other, and where you find them all working together, there you will find the greatest progress being made. We must put up buildings which mean permanency. We believe the time has come when the farmers should make a greater effort to help themselves. An isolated meeting in a district once a year does not result in very much good to the dairymen of that community, and I would appeal to you to form some sort of a local organization, call them what you may—local dairy associations or institutes or clubs. Get together, and discuss your own local conditions, and make a study of the literature which is sent to you by the Department, and the excellent agricultural papers that you receive. The Department has just issued a little booklet on the formation of these local clubs. We give you some general directions, and leave it to the good sense of the men in the locality to work it out. Already we have 100 of these local organizations, which are holding monthly meetings for the discussion of problems of interest. You know the success that has attended efforts of this kind in connection with fruit, and we hope the dairymen will look upon their industry from a broad standpoint. I can assure you that the Department will continue the assistance it has been so liberally giving you in the past, and if there is anything that I can do, or Mr. Publow can do, we will be only too glad to help you. I do not think the Department has turned down a call for assistance in any locality; we are always ready to give you assistance.

WINTER DAIRYING.

By Henry Glendenning, Manilla.

The subject I am down for is Winter Dairying, but I do not intend to confine my remarks solely to that side of the question. The first objection to Winter Dairying that will be raised will be with regard to labor. Farmers find it difficult to get men to milk in the winter season, but I do not believe the difficulty is nearly so great as the average farmer thinks. At the present time in Eastern Ontario the great difficulty is with the men who are hired for only six or seven months. These men receive a wage that is nearly equal to that of the man hired for the full twelve months.

In the first place, if your man is a first class one he will look for some other employment during the balance of the year and he goes to the city or the lumber camp or the mining camp, and in that way the best men are often lost to the farming community. If he had hired with the farmer for the whole year the chances are he would continue year after year with the same man. It is an advantage to the man to engage with a farmer for the year because he gets a warm comfortable home, he is at very little expense except for his clothes, and he generally starts out each year with an addition to his bank account, while the man who is hired for a few months usually commences each year at the same place. I do not believe in working unless I have a profit out of my work. In those sections where they carry on dairying the year round you will find the cows are giving a larger flow of milk in the summer months than those which are milking only in the summer. A good many farmers think a cow should get a long rest, and from the time she goes dry she is allowed to run upon a very low ration, and instead of fleshing up her flesh goes down and her bones come up, and she goes out in the spring in a low condition, and no cow of that kind ever made a great record, and it will take several months of the best part of the season after she goes on the grass to get that cow in anything like fair condition for the production of milk, and by the time she has got into good condition the best of the pastures are gone and it is never known what that cow could do.

How did that cow do so remarkably well that Mr. Whitley told us produced 10,000 pounds of milk? I do not know the man, but I know how he did it. He fed that cow. She was fed during the time she was dry as well as when she was milking. If the cow is in high condition she is in a position to develop her organs; she develops a large udder and milk veins, and where cows are milked for ten months you will find them flesh up during the two months they are dry.

Under what conditions does the cow produce milk and make a profit? When she is turned out on the grass she has sunshine and abundance of fresh water, succulent food with the proper nutrients in it for the production of milk. She cleans herself off and casts her hair, and under these conditions we find the cow does best.

Now, we have just to carry these conditions into the stable. We must provide our cows with warm, comfortable, well-ventilated quarters with plenty of sunlight streaming into the stables, with plenty of water and with food that is similar to what they get in the grass fields. It should be bulky, succulent, and palatable, and contain the proper nutrients and at the same time it must be cheap. We have had this season an abundant crop of corn, and in a great many sections it has been properly saved; but the man who depends entirely upon corn for the production of milk is not likely to produce very much milk. We want her to be a consumer of a large quantity of food. It requires about two-thirds of all the food that we feed our animals to maintain them, and the profit lies in the extra food we get them to partake of and digest, so it is important to have the cow consume a large amount of food.

There are many cows in this country that are a great deal better than we have any idea of. Sometimes you will hear of a cow that is kept in a village that gives a large amount of milk and some farmer is anxious to buy her, and when they do so she is put into his herd and does not do nearly so well, and then the farmer will often say, "That man in the village got all out of her that was in her." The reason was that she there got the attention or proper feed. We must put the proper nutrients into the cow to

produce milk, and we do not get bulk, succulency and palatability. I have on my chart here a number of the common food stuffs of the country.

Feed.	Dry matter.	Ash	Protein.	Carbo-hydrates.	Fat.	Nutritive ratio.
June Grass, green.	34.9	2.8	3.0	19.8	.8	1: 7.2
Corn silage.....	20.9	1.4	.9	11.3	.7	1:14.4
Mangels	9.1	1.1	1.1	5.4	.1	1: 5.1
Timothy Hay....	86.8	4.5	2.8	43.4	1.4	1: 6.7
Red Clover Hay..	84.7	6.6	6.8	35.8	1.7	1: 5.8
White Clover Hay	90.3	8.3	11.5	42.2	1.5	1: 4.0
Wheat Bran.....	88.1	5.8	12.2	39.2	2.7	1: 3.7
Oats	89.0	3.0	9.2	47.3	4.2	1: 6.2
Milk.....	12.8	.7	3.6	4.9	3.7	1: 3.8
Alfalfa Hay.....	91.6	7.4	11.0	39.6	1.2	1: 3.8

One hundred pounds milk contains about thirteen pounds of dry matter and seventy-eight pounds of water. The most important element in the milk from a commercial standpoint is the fat, but when we look for a high class feed stuff we look for one that contains a high percentage of protein, and corn silage contains only 9-10 of a pound in 100 lbs. of silage. If a cow gave 50 lbs. of milk in a day, and if she used all of the protein in feed for producing that milk, she would require to eat 200 lbs. of corn silage, which would be a physical impossibility. One of the common feeds used by dairymen to supply the protein has been wheat bran.

The principal difficulty I see about bran to-day is the price. Even with the high price of milk and dairy products, I do not think there is much profit in feeding bran at $24 a ton. I would not stand up and advocate your buying wheat bran and then selling the milk for making cheese and butter if you had to pay $24 a ton for the bran. There are certain conditions under which it would pay to give that price, but I am speaking in the ordinary way of producing milk cheaply. Alfalfa hay contains 11 pounds of protein in the 100. It is not quite as good as the wheat bran, but close to it, 11 pounds instead of 12.2. In 20 pounds of alfalfa hay you have as much protein as you have in 18½ pounds of bran.

Under ordinary conditions you can put alfalfa hay into your barns at a cost of $2 per ton, paying for rent and labour. That is where you get three cuttings in the year. We could not do that this year because we only cut it twice. If you feed 20 pounds of alfalfa a day it costs you 2c. and 18½ pounds of bran at $24 would cost you 22 1-5c., a difference of 20c. a day in feeding bran as compared with alfalfa.

I want to give you something that has happened in our own herd. This is not something that has happened in some far distant land, but right at home. One cow dropped her calf on the 1st of January, 1908. This was her second calf, and seven days after that she was put on the test. The food was all weighed out to her, and the milk was weighed, and a sample taken night and morning and put into a bottle, and at the end of the week duplicate tests were made on that bottle of milk. She was fed fifteen pounds of corn silage that cost $2 a ton. We should have fed thirty-five or forty pounds, but our corn was a failure and we didn't have the silage we should have had. She was fed sixty pounds of roots, which cost us four cents a bushel, and she was fed twenty pounds of alfalfa hay at $2 a ton.

Now this cow never ate twenty pounds of hay a day, but that was weighed out to her, and the herdsman said the cows on each side of her could reach it, and they had more or less of the hay. Eighteen pounds was about what she consumed, but it was all charged to her and that made a cost of 7½c. a day to feed the cow. There was a little oat straw cut with the silage but no charge was made for that. She gave 290½ pounds of milk in seven days, or an average of 41½ pounds of milk per day, 11.62 lbs. fat, for which we received net 29c., and we had all of the skim milk at home to feed to the calves or pigs. That realized about 3.37c. The cost of feeding for seven days was 52½c., leaving a profit of $2.84½, less the labor; 100 pounds of 4 per cent. milk cost us 18.07c. The cost of butter, allowing 15 per cent. for over-run, was 4c. a pound. That cow was in high condition when she came in and at her best for giving the large flow, and I would not like you to run away with the idea that all our cows are doing well. She was not the best or the worst cow, but the best at that particular time. No doubt but a large amount of the energy that was stored up during the dry period went into the pail.

I want to give you the result for November last. There are twenty-five cows in the herd, and seventeen of the twenty-five have had their first calf, and they all dropped their calf at the age of two years or a little over, so you see they are too young to make a great record.

Somebody will say, "How do you happen to have so many two year olds?" Last year we found we were going to get more cows around us than we could handle and we sold a number of the older ones. There were some cows that had lost a quarter of the udder and we sold them at auction for what they would bring, and we are starting in practically with a young herd. I had the herdsman weigh out the feed for one day and make a careful computation of the feed those cows received.

This year we had a great crop of corn, and the actual cost of production so far as I could figure it was $1.25 for silage per ton placed in the silo. We feed thirteen ton of corn silage for the thirty days, $16.25; forty pounds of roots at 4c. a bushel, $20.00; twelve pounds of alfalfa hay at $3.00 a ton, $13.60. Your total cost for the month of November would be $49.85.

Some of these cows were nearly dry, three of them went dry in December. All of the butter, cream and milk that was required for a large family was kept at home, and all the skim milk was kept at home for feeding the calves and pigs. We simply took the check we received at the creamery, after the cost of manufacturing, drawing and everything was paid for, and the check was $101.17, leaving a profit after deduction of the cost of feed of $51.42. I find that the feed for the month of November where cows were continually in the stable was a trifle less than $2 a month. I believe we can produce milk quite as cheaply, and that the profits are quite as large, under winter conditions as they are in summer. If our cows had been three or more years older the result would have been much better.

The question will arise, can you in this section grow Alfalfa hay? Any land that is good for growing red clover will produce Alfalfa. It will not do on wet flat lands. The land should be sufficiently rolling to run the water off and it should be clean, and in a good state of cultivation, and you require a good deal of lime in your soil. We sow about twenty pounds of Alfalfa seed to the acre, and when you are growing it for the first time don't fail to get a supply of nitro-culture to apply to the seed. You can get it from the Agricultural College at Guelph. If you have grown Alfalfa before on the same land you do not require the nitro-culture. You should

not pasture your Alfalfa fields. If you do, the cattle and horses will destroy it. Do not cut it late in the fall because it will not grow very fast when the cold weather comes.

Q.—About how late would you cut?

A.—It should be cut the last time in September.

Q.—What do you generally sow it with, oats or barley?

A.—We have had the best results with three pecks of barley to the acre and be sure and sow it in front of the drill.

Q.—How many tons do you cut to the acre?

A.—I consider the average crop from five to six tons per acre when you get three cuttings in the season.

Q.—You say you can pay rent and harvest and seeding and put it in the barn for $2 a ton?

A.—Yes I can give you the figures.

Q.—How often do you feed your cows a day?

A.—Twice; they are fed Alfalfa hay and corn silage and roots and the man throws in some oat straw to them.

Q.—Does your herdsman feed the quantity mentioned of corn silage, Alfalfa and roots at each feed?

A.—No, that is what they get in the day.

Q.—What do you feed first in the morning?

A.—They are fed roots and corn silage in the morning and Alfalfa after, and then after the milking is all done they get the long straw.

Cost of Producing Alfalfa Hay. Now these figures I am going to give you were taken in 1906. It was an eight acre field, rent $4 an acre, the seed is included in that $32. Ten hours for cutting, $3. Nine hours tedding, that tedds the fields twice, $2.25; four and a half hours raking, $1.15; coiling up and turning out coils before bringing them into the barn, $5; four men and two teams hauling one day, $8; one man in the mow, $1.50, a horse and boy on the fork, $1.00; total, $53.90. That is the first cutting. I expect three tons an acre, that is twenty-four tons for the eight acres. For second cutting you have no rent to pay. The cutting and raking is the same price, but there is no coiling up because the crop is not as heavy, and it cures more readily, $11.15 twelve tons. Third cutting and raking is all the same price; two teams and three men with loader, $3; man in the mow, 50c. and a boy, 40c., making $20.30 for that cutting. We cut six tons, making forty-two tons altogether, the total cost being $75.35. That figures out $1.79 a ton. I said $2.00; the other twenty-one cents is put on for incidentals such as rain that would increase the labour in curing the hay.

Q.—What time do you generally make the first cutting?

A.—Generally from the first of June to two weeks later. I cut it just when it is coming into bloom.

Q.—Your land is in a high state of cultivation?

A.—Yes.

Q.—You should take the average farm?

A.—I would not care to give you $4 an acre rent for inferior land. Don't wait until it is in full bloom. Cut when one-tenth of the blossoms are out, or the stalks will become woody, and the leaves will drop off. Remember the leaf is the most important part of the plant.

Q.—Do you use any salt?

A.—I used to, but I would not allow any man to put any salt on hay of any kind. If you salt hay heavily it will always come out of the mow dark, and will be extremely dry and the leaves will drop off.

A MEMBER: I have grown Alfalfa for twenty years, and I live three miles from this town, and I always grow it mixed with red clover and alsike. If it gets musty at all it will be in the red clover or the alsike. I find that the Alfalfa cures easier than red clover or alsilke.

Q.—How many years do you leave that crop in the soil?

A.—Sometimes only three years. I have left it in as long as seven, eight or ten years.

Q.—Does not the Alfalfa crowd out everything else after three or four years?

Mr. GLENDENNING: No; red clover won't last more than two or three years.

Q.—How do you break up a field of Alfalfa?

A.—It is a very hard crop to break up. The best way to do is to turn your stock into the field in the fall and pasture it off bare. Then allow your colts and horses to run on that field in the fine days in the winter, and every bite they make means a dead plant. Then along about the 10th of May get a narrow-sheared plow and plow up the field, and put it into corn. The biggest crop of corn we ever grew was grown on Alfalfa sod.

Mr. HYATT: Last year Mr. Glendinning gave an address on growing Alfalfa in Prince Edward, and last year we sowed three thousand acres, and I would like to ask if he has had any letters from there.

Mr. GLENDINNING: I think I have three or four letters from Prince Edward County with regard to that. Mr. Wellington Boulter, one of the leading farmers, wrote and said, "From what you said at Picton I put in ten acres of Alfalfa, and I am delighted with the result, and I would like you to tell me whether I can get good reliable seed so that I can sow thirty acres more next year.

ONTARIO AGRICULTURAL CONDITIONS.

BY C. C. JAMES, DEPUTY MINISTER OF AGRICULTURE, TORONTO.

On rising, Mr. James was presented with a beautiful bouquet. He said: Toward the end of the year when we sit in our office in the Agricultural Department and work away trying to straighten out the affairs of the year and get ready for the new year, we begin to wonder after all whether there is anything in this Agricultural work, and whether we are making any progress. But when we come to the annual convention of the Eastern Dairymen's Association, and see the genial face of the Honorary President, and find that he is as enthusiastic as ever, and see our old friend, Mr. Dargavel still presiding over the meetings, and when we listen to Mr. Glendenning still preaching the gospel of alfalfa, and find such a crowd as we do here this evening listening intently and asking questions, and all apparently with one purpose, that of gaining more knowledge in connection with the great dairy industry, we feel after all that interest in this great question is not dead.

The dairymen of Ontario, and especially the dairymen of Eastern Ontario, appear to be very much alive, and the gathering which you have to-night, which is a compliment I presume, to this Association, shows that the people of Prescott, and those who live in this vicinity have faith in the dairy industry.

On an occasion of this kind in connection with the evening meeting, you don't look for such instructive talks as you had this afternoon. We are not supposed to talk shop, exactly, but are permitted to address ourselves more to a mixed audience such as we have here this evening. It may be permitted, therefore, that I say a little in regard to the general subject of agricultural work. What are we doing? What are we going to do? What is there to be done? What hopes have we that anything or much more can be done in connection with the agricultural industry of this Province? What does it mean to this country or any other country? You are all quite well aware that Canada has been passing through an era of serious conditions. Perhaps you are aware that the great country to the south of us has had to pass through even more serious conditions than we have had. If any of you have been watching the American papers during the last few days, you would notice that just about the New Year, when it was customary for people to look over the past year to see what they had been going through, and to look forward into the New Year to find what hopes there were for the future—you will have noticed that through a great many of these journals there has been running a note of promise. They are looking forward to a prosperous year, and the great thing that has advanced that promise, the great revival of good times, is that during the past year American farmers have produced about seven billion dollars ($7,000,000,000) worth of products. They do not talk about the products of their mines, they do not talk about the products of their forests or the manufacturing establishments, but they all point to that big figure, which is so large that one cannot comprehend it, and they say the American farmers during the past year have produced upon the land seven billion dollars worth of material. Why did they not refer to those other things? Because they know that seven billion dollars worth of product will start the men working in the mines, in the lumber camps, and the great manufacturing establishments of the country. And if it had not been for the seven billion dollars worth produced by the farmers of the United States there would have been very little use to go to the mines, very little use to go to the forests, and the great manufacturing establishments would have to remain closed.

We see the same arguments being advanced, only in a milder type, by the leading papers in this country. They are trying to build up our hopes by saying that during the past year the farmers of the Western Provinces have produced $75,000,000 worth of wheat, and they have produced so many million dollars worth of other material; and the farmers of Ontario have also added materially; so that out of the product of the farms of the country there will be started all the other great industries, and their success will be based largely and primarily upon the work that the farmer first of all has done. And that is why you, in the town of Prescott, and we, who live in the city of Toronto, look for the first indication of prosperity and revival of business, not to the lumber camps, or to the mines, or to the manufacturing establishments. We rather turn our eyes towards the country, and ask, "What are the conditions, and what are the farmers doing?" because they, to a very large extent hold in their hands the key to the great business interests of this country. And so you, as citizens of this town of Prescott, are directly interested in the welfare and progress of the farmers of Eastern Ontario, and it is quite fit and proper that you should come out to meetings of this kind, and that you should, as far as possible, attend meetings held in the daytime, so that you may see what the farmers of this Province are doing, and get in touch with that great industry which lies at the basis of our other great industries in this country.

Is there anything being done to further develop this great industry? Is there anything being done systematically or are we going at this business in a haphazard way?

Talk to the manufacturer and ask him whether the manufacturing industries in this country are being left largely to chance, and he would laugh at you. He would say, "No, our business is systematized and we are studying it from the ground up. We are studying the cost of our material and machinery, and we look for new methods of handling our goods, and for the best workmen we can get. We are drawing the line closely between the cost of production, and we are, from day to day, and week by week, and month by month, looking carfully at every part of our operations, because we know we must study these things carefully and closely."

So, I say, if it is so necessary in connection with our great industrial business, there must be some reason for applying this same close study to this greatest of all industries, the agriculture of Ontario; and for this reason you may well ask us to whether the Eastern Dairymen's Association or the Department of Agriculture, with its allied institutions, is going about its work in a haphazard way, or whether we are trying to work in a systematic manner to build up the Agricultural industry of this country.

I will try to give you in brief a statement of a scheme on which some of us are trying to work out this great industry. Agriculture in its original definition means cultivation of the field. The farmer starts with the soil, and so any connected system carried on, any great undertaking set going for the improvement of an agricultural country, should begin with the foundation. What I am saying in regard to agriculture as a whole should apply to each individual farmer, and the dairymen should apply the same line of reasoning.

First of all, we start with the soil in this country. Those of you who have travelled to other Provinces, and to neighboring states, are well aware that in this Province of Ontario we have a soil which is peculiarly adapted to agricultural work. Now the first question that we as workers ought to ask ourselves is this: "Can we, by any means within our power, assist in the development in that great field of agriculture—that is the soil itself?" The question came up in connection with Mr. Glendenning's paper. The point was raised that he had made his calculation on a field that was a little above the average, and it seems to me the point that was brought out there must have brought home to every person listening a very important point, namely, that the best farming operations can be carried on only on the best soil, or upon soil in its best condition. And so it seems to me that, looking over the Province as a whole, it is the duty of those who are concerned in the great agricultural movement to see that the soils of the Province of Ontario are used to the best advantage to find out in what way can this be accomplished? What movement can be set into operation that will materially improve the soil cultivated in this country?

In the first place, there is a considerable area utterly unadapted to agriculture. Necessarily, when the settlers first came into this Province, which was then covered with forest, they had not then an opportunity to choose, and they had to settle to a large extent, wherever the opportunity presented itself. The result has been that after many of these farms were cleared of their timber, there was left a soil which was entirely unfit for agricultural purposes. You go throughout this country from east to west, and you will find a great many farmers trying to eke out a living on farms that are utterly unadapted to agriculture. What is our duty to-day under those circumstances? Surely it should be in some way or other to advise

with those farmers, and to assist them to get off of these untillable farms where there is very little soil, or from those loose sandy soils, and to encourage them to settle on lands far better adapted to agricultural work.

It may be that in this audience there are men who are confronted with that problem. The soil is not adapted to their work, and so a great many of them are looking to the Western prairie—Manitoba, Alberta and Saskatchewan—attracted by the wonderful development out there. I want to say here that if any of you are at present considering such a proposition as that, we would like to ask you before you make up your minds to leave this Province to go north into our own country, and you will find a land that will surprise you. Three or four hundred miles north of here you get beyond the height of land into a wonderful belt of clay country largely covered at the present time with spruce and other trees, where you can build up for yourself a farm home as fine and as promising as are the majority of the farms here in the southern part of the Province. The people of this country will, one of these days, be very much surprised indeed to find that we have opened up a country in Northern Ontario well adapted for agriculture, and larger in area than the old settled portion of the south.

Then we have considerable areas that have once been covered with forest, but are no longer adapted to agricultural work, having light, loose soil. We have carefully examined the Province in a great many of these sections, and lately there has been inaugurated a Government plan whereby considerable of the areas are being brought back into the possession of the Crown, and we are making of them forest areas and endeavouring to cover them with forests. There are other areas that are of very little use at present, because they are water logged; and that is a matter that every farmer ought to give very careful and close attention to. The reason for drawing particular attention to this is that in nine cases out of ten these are the richest portions of the farm, being unsuited for agriculture at present simply and solely because they contain too large a quantity of water. We have inaugurated during the last year or two a general plan, looking to assist farmers throughout the Province, whereby they can adopt some cheap and simple method of draining these lands and making them productive.

We move up from the soil to its productions. The average production of the farms of this country is larger than it is in some other countries, but when we compare Ontario with some of the other countries of Europe, England, France, Germany, Belgium and Holland, and parts of Italy, where intensive agriculture has been carried on for a thousand years or more, we must ask ourselves the question, "Why in a country that is only one hundred years old are we unable to produce results that are now being got in these old countries of Europe that have been farmed for a thousand years or more?" It behooves us to settle down and consider whether by any means we can improve the crop production. In connection with the Provincial Department of Agriculture we are trying to do this. We are trying to encourage the farmer to sow better seed. Take one stalk of wheat or oats, and the kernels of grain upon that stalk, and if by any means you can add one grain to each stalk, or if you can multiply the number of stalks, the total for the Province would not be 100,000 bushels, it would be millions. Is it worth working for? Certainly it is. If we can add a few million bushels it means larger crops, more feed for our cattle, and more butter and cheese; and those who know, tell us it is a very simple matter. There is a great difference between 1st class, 2nd class, 3rd or 4th class grain. The individual farmer must look after this on his own farm: the Department cannot do that for him. The Eastern Ontario Dairymen's Association can-

not do it. How is it to be done? All you have to do is to get in touch with our men at Guelph and Ottawa and they will supply you with samples of this improved wheat, oats, or barley, and they will show you how, by selection, you can take that which you are now growing upon your farm and improve it so that you can add 1 per cent., 5 per cent., 10 per cent., 25 per cent., and in fact 50 per cent. to the annual production.

Q.—What are we going to do with these crops? Years ago they were taken to the market; but that day has long gone by, and Ontario is no longer a great grain-producing Province for export. What are we doing with it? We have our barns, our cattle and our sheep and swine; and now instead of putting this wheat and oats and barley into the waggon or sleigh and hauling it to town and selling it for cash, it is fed to the cattle and the hogs and sells as milk, butter, cheese, bacon or beef. If you go into a large manufacturing establishment and ask the proprietor what he is manufacturing, he will tell you such and such a line of goods. "How are you doing it?" By hand? "Oh, no, I have machinery." "I suppose any old machinery will do?" "Bless you, no. I put in the largest and best possible machinery I can get. I put in a new machine last year, and I heard of a better one six months afterwards and replaced it." You say to farmer Brown, "I see you have gone into the manufacturing business?" "Yes, I am growing oats, wheat and barley, and I find I was not only selling wheat and oats and barley, but I was selling the very farm itself, and so I decided I would put in machinery and turn these oats and wheat and barley and alfalfa into a finished product. I decided that I would produce milk." "What kind of a machine have you got? Have you got an up-to-date machine?" "I do not know. It is a cow. That is all I know about it. She eats so much and gives some milk." "Does she do it economically?" "I do not know." You would set down the manufacturer as foolish if he did not know whether the machinery he had in his establishment was making money for him or not, or whether it was paying its way. Every dairy farmer in this country should know whether the machines he is using on his farm are paying him or not. A lot of our most progressive dairymen in the east and west are carefully considering this question, and they are weighing and testing milk and keeping an accurate record, so that they can tell you as to what these living machines in the barn are doing, and whether they are paying or not. The success of this movement rests not with the people of Toronto or Guelph, but it will be settled only upon the separate and individual farms of this country. So I say that every man who comes to this Convention should go away from here and endeavor as far as possible to apply to his own work the principles which these speakers have been trying to teach from this platform.

I sometimes think that we have been emphasizing to too great an extent the money end of the transaction; yet, after all, it is very necessary and important that we should consider this question of dollars and cents. If a farmer cannot make ends meet then he must go out of business. But in the discussion of these agricultural questions from the dollars and cents standpoint we ought to be very careful that we do not lose sight of other great questions which equally concern the farm life of this country. It would be a sorry day for Canada if the farmers got it into their heads that the one sole object of agriculture was to make money. I think you will agree with me the acquisition of money is one of the lowest motives which should actuate a human being.

Let us not forget that there are other great questions in connection with agriculture to which we ought to give equal importance—social life and home

life, for instance. People who live in the country sometimes envy the men who live in the city. Your boys and girls should be of more importance to you than your crops or your cattle. The men of this country have left the solving of that question to the women on the farm, and in connection with our Women's Institute work, these questions have been taken up and discussed; and I thinks perhaps that as an outcome of that Women's Institute movement we shall see inaugurated a new life into the agriculture of this country, and a new social development which will result in brighter farm homes. (Applause.)

This, to my mind, is to-day one of the most important questions facing this country. The life of Ontario depends more upon the condition of the farm life than it does upon the condition of the town and city life. The northwest—Manitoba, Alberta and Saskatchewan—have been draining some of the counties of this Province, until one wonders who can be left to carry on the agricultural work. Our great towns and cities, also have been attracting our boys and girls by the tens-of-thousands; and one of the great questions that confronts us to-day is how we shall keep on the farms of this country a sufficient number of our young men and women, so that we should not have to take their places by raw recruits from across the Atlantic? Ask yourselves whether in the townships in which you live there has not been going on for years the draining of the best blood, the best thought and life out of that county, not simply by the great Northwest, but by our towns and cities. We ought to sit down and give careful consideration to these social, educational and moral questions which after all are of more importance to this country than the making of dollars and cents.

I trust that we, who are directly concerned with the agricultural life of this country will give those in our own homes careful thought, and see whether in addition to improving the soil and crops and stock, we cannot in some way devise some means whereby there shall be a decided improvement in the home life—to add to the social, intellectual and moral quality which is manifested in the rural life of this country, which are in my opinion the greatest assets of the Province of Ontario. (Applause.)

The CHAIRMAN: I have now much pleasure in introducing to you Professor Creelman. We sometimes forget that this Province has that wonderful asset in the Agricultural College at Guelph. I do not think they get as many students from Eastern Ontario as they are intitled to. The Agricultural College is a wonderful asset of the Province of Ontario, and why we in the east do not take more interest in it, I do not know. It is a great loss to the young men in Eastern Ontario, and to the ladies as well. I had the pleasure of visiting that institution a year ago, and I am sure it was a revelation to me to see what I saw there. I could not help but feel sorry that some of our young ladies and young men were not taking advantage of the wonderful facilities of that place.

ADDRESS.

By GEORGE C. CREELMAN, PRESIDENT OF ONTARIO AGRICULTURE COLLEGE GUELPH.

Mr. Creelman on rising to address the audience, was also presented with a handsome bouquet. He said: It is a great pleasure to me, and a great privilege, to be invited year after year to the Eastern Dairymen's Association of this great Province of Ontario, and to be allowed to sit upon the platform, and stand upon my feet and say something to the intelligent farmers

and townspeople of this Province, in reference to the work which is being done in our College. It is my special privilege to come to you to-night to say something about the conditions existing in this Province as comparing with the existing conditions in agriculture in other parts of the world. It was my privilege this year for the first time to take two or three months off from my business in Guelph, and to go to the Old Land and there have my eyes opened to what was going on in agriculture. We get to think as we travel out to our Northwestern Territorries and see the towns springing up that we are an old people in the Province of Ontario, and can give pointers to the people of these Western towns, and cities; but it takes all the conceit out of one when he starts, as I did, from the City of New York and landed upon the soil in that old country of Italy, where they cultivate 85 per cent. of the land that is devoted to farm work, and raise 510,000,000 bushels of cereals each year, in addition to tobacco and wine. And just before leaving home, I had received the returns from our College dairy herd for the year, and found that one cow in that dairy herd had produced on the farm the year before 20,778 pounds of milk in one year. I was not prepared when I landed in that older civilization to be met within one hundred yards of the wharf by a boy driving a flock of goats from door to door, and supplying the citizens from day to day with milk while you wait. (Laughter and applause). And I was not prepared when I went up into that beautiful country in Northern Italy and examined more carefully into their modes of farming to find people in the fields spading the sod for wheat—not using plows, not using even the slow oxen; but spading their orchards and spading their fields.

You say labour must be cheap. They work for 50 cents a day and board themselves; and in some places even as low as 40 cents and 25 cents a day. But you could not put up with the slowness of the Italian peasant as I saw him working with a spade made in a blacksmith shop, preparing the land for wheat.

I can hardly understand how it could be that land was renting at from seven to twelve dollars an acre: yet people were paying it, using that kind of labor and implements, I said: "How can it be done?" and they said they did not know. I had to dig in for myself and find out what they were doing, and I discovered two things that set me thinking. In the first place by spading they knew just exactly the nature of the soil they were turning over, and they studied it. They knew from long experience just about what treatment that field should get in order to obtain the largest possible returns. The second thing, they actually lived from the first of January to the first of January of the next year upon things that we allow to go to waste—upon the leaks on the ordinary farms in the Province of Ontario.

I do not mean to say the average farmer is wasteful, or has leaks running away with the profits of the farm; but I do say that we work too much land. (Applause.) We say, "I have only seventy-five or one hundred acres, and I believe I could do better if I had a hundred and fifty acres." We do not stop to think the difference between the average and the possible crop in this Province of Ontario is yet over 100 per cent., and we are not working our land nearly as well as it ought to be worked. Mr. James touched upon my text to-night, when he said that the individual is after all the important factor in this work.

There are a few men in this Province to whom we can point with pride, who have steered this old agriculture ship of state to the proud position we now occupy. I refer, first to my predecessor at the Ontario Agricultural College, Dr. James Mills, now on the Dominion Railway Commission. (Applause.) I refer to Senator Derbyshire, and I refer to a man whose name many of you have never heard, a man by the name of James Leask. We hear

of the great lawyers and the great doctors, but we do not hear much of the great stock breeders, who have done so much for this Province. Mr. James Leask had on his own farm without the assistance of anybody, but his own keen insight, taken a young animal and fed it and nursed it. It was then taken to the great National Exhibition of Chicago, and won first prize against all comers on the continent of America. You say that is an accident, I say it is not. That was in 1907; in 1908, he took another beast to Chicago, and it was only after long deliberation that the judges were able to decide between his and the first prize animal.

There are just as great rewards to be made by individuals in agriculture as there are in any of the professions, and the individual has just the same chance for development and success in agriculture as in anything else.

If I were a dairy man in Eastern Ontario, I would rather have my neighbors know that in the year just passed, I had from a given number of cows produced more milk, and sent it to the factory, and secured a larger check than my neighbors, than have it said of me that I was reeve of the township, or warden of the county, or mayor of the city of Toronto; because I would have done it without the assistance of my friends. What we want is not better breeders but better feeders.

When a man gets so fond of his cows that when he is feeding or milking them he is thinking of cow and nothing else, he is likely to make a success. We do too many things mechanically on the farm. Mr. Putman said in some dairy districts they had an average of only 2,500 pounds of milk per cow per season.

Now, when I tell you that we have one cow in our herd that produced 20,778 pounds per season, you will see what I mean when I say the difference between the average and the possible is so great that there is a chance for more individual work.

The next thing I have got to say is we do not want more breeds and varieties, but we want better strains. I do not believe there is a week goes without Prof. Graham or myself getting a letter asking, "What is the best breed of chicken for me to raise?" I do not think they ever get a direct answer to that question.

We have in our flocks hens that every year eat their heads off, and we have come to this conclusion that after careful observation and counting the eggs that each hen lays during the year, we have been able to create flocks that give us the very best results. We have strains of hens that we have developed by securing their eggs and keeping pullets, and then saving their eggs and saving the pullets. We now have a strain where the flock averaged 200 eggs per year. You say "Is that all you have to do—watch the hens lay?" That is all one man has to do one day. But there is another man doing something else. He is counting the kernels in the wheat, and taking the big ones and planting them; and the same with the barley, and oats and rye. C. A. Zavitz does not do anything else, practically, but look after that kind of work. I have not time to tell the results of the work of that man, who has 4,500 men co-operating with him through the Experimental Union spreading this good seed throughout the Province; but the result has been an increase of millions of bushels of grain and roots. The same thing applies to your dairy cattle. If you get a good milking strain you should not let them go, even if you are offered $100 a head.

Not better implements, but the better care of them. As I travel from township to township, and county to county, I see a lot of implements that are not properly cared for. I find that the boys who come to us from the farms of the Province, are not familiar with the implements they use, and during the past year we have an increasing number coming from the Eastern part of

the Province. We take these boys into our implement demonstrating room, and they are allowed to take hold of these implements and take them apart and put them together again, and they become quite handy with a monkey-wrench, and more interested with the machinery than they were before. They are taught how to oil and care for these machines, and make ordinary repairs.

In many of the old countries I found they had very neat looking barns. I was very glad to get home after so many rainy days in the Old Land. It was too cold in Italy to enjoy it, and too hot in France, and too wet in England, and just about right when I landed on the shores of the St. Lawrence. (Applause.) But when I passed up through this country it was rather the exception to find a well appointed farm homestead and painted house, and with vines and flowers about it, and a well ordered barn a proper distance from the house and trees between. These things were rather the exceptions after coming fresh from the Old Land. When you are thinking of building a barn, instead of hiring a carpenter and letting him build it in the old way, build it so that it will be fitted for the business you intend to carry on. A little more money spent in this way would often make things more comfortable on the farm. Every man over forty years of age is entitled to enough money to enable him to mingle with his friends when it is not going to interfere with his business.

It is not so much what we do with our girls, as what we do with the girls we do not get. We take about 300 girls a year, and they are from good homes, and we give them instruction in household duties, teach them to save steps, teach them cooking, sewing and laundry work, so that these three things may not become drudgery to the individual woman who is going to have to do them. Only five per cent. of the women of the Province keep servants; the other 95 per cent. do their own work. Therefore, I say it is important that every girl should be given practical education in these three things. We educate teachers at the Macdonald Institute, so they can go into the schools and teach the girls these things as well as the ordinary public school studies, and I want to appeal to you members of rural communities to secure a better class of teachers. Would not it be better that you should pay $3 more taxes for school purposes in order that your children might get a better education. I have no quarrel with the educational system of this Province. We have a good educational system, but the system has been directed, up to this time, first through the city schools and town schools, and then into the country, rather than from the country places first—teaching the boys and girls things that would be so valuable to them in the country homes, and then working from there to the villages and cities. The present day public school teacher is not old enough for the work in hand. She is of her own volition forced along the line of least resistance through the High Schools and gets to be a teacher, so she can earn money to go on through other things, and we accept her and put her into our schools to teach our children. It is not her fault, but I say the rural school trustees should have the option of selecting experienced teachers, and they should be willing to pay more for an experienced teacher. The boys and girls in our schools are not taught those things which help them in every business, and I think we should change our method of teaching and give our children more practical instruction.

Dr. Reid, M.P: I think those who originated the idea of the Association coming here are entitled to a great deal of credit. I feel that a great deal of good will arise from this meeting. I claim to be a farmer. I am living on a farm, and do a little in farming business. I had a little experience in feeding hogs, but I was just $5 out at the end of the deal. I went

into the cattle business, and I have six or eight cows, and I followed out the ideas that I got at a meeting in this hall about a year or two ago. I remember hearing a speech from Senator Derbyshire, and I kept the cows on the lines suggested, and I must say that the results are much better than I expected. When I told some people of the results I had from five or six cows, they really did not believe it.

The Governments both at Ottawa and Toronto are anxious to do all they can in the interests of the farmers of this country, but it depends on the farmers in the constituency to give information and advice, so that we can intelligently bring before the Government what is necessary in the interests of the farmers. So far as I am concerned as your representative, and so far as other members of the House of Commons are concerned, it is only a pleasure to take up any matter of interest to the farmers of the community. (Applause.)

ILLUSTRATED LECTURE.

By J. A. Ruddick, Chief Dairy Division, Ottawa.

The lecturer exhibited on the curtain a number of pictures illustrating dairying in different parts of the world, which was much appreciated by the large audience.

THE CARE OF MILK FOR CHEESE-MAKING.

By G. H. Barr, Dairy Division, Ottawa.

For a report of this address see proceedings of The Western Dairy Convention. The following discussion ensued:

Q.—How about the morning's milk?

A.—It was just taken to the factory without any airing or cooling.

Q.—Don't you think it would be better to have cleats under the cans so as to raise it up and let the water get under the bottom?

A.—Yes, I think that would be a good plan.

Q.—You believe you had no gassy curds from the morning's milk?

A.—No, we had no gassy curds.

Q.—How would it do to drop some clean ice right into the milk?

A.—I would not do that; you would be fined for watering the milk.

Q.—If the milk was mixed on the farm with the morning's milk, should not it be cooled to a lower temperature?

A.—Yes, I think you should cool the evening's milk down to at least 65 degrees if you are going to mix it.

Q.—Is it advisable to mix milk?

A.—Not if you can help it.

Q.—Do you empty that water every day?

A.—No.

Q.—How long would you have to pump water?

A.—I can pump enough in about eight minutes.

Q.—How would you hold the cans in place?

A.—The best way is to have cleats to hold them in place.

Q.—Will they rust?

A.—Yes, they will rust; but that can be avoided in a number of ways. Painting the outside of the cans will do it.

Mr. RUDDICK: I would like to add a word to what Mr. Barr has said. I am sure you will all agree with me on two points; first, that the work which Mr. Barr has carried out shows most conclusive results. I do not know of any experimental work that I have had anything to do with where the results have been so conclusive as they have in connection with this experiment.

I think you will admit another thing, and that is, that our method of presenting these experiments with lantern slides is the most effective way in which it could be put before you. (Applause.) We intend to follow up that line of work. (Applause.) I would like to tell you how this work came to be undertaken. One member of my staff in the Province of Ontario, attended a meeting and he spoke about the aeration of milk, and advocated not to air it but to cool it. The question was taken up by one of the leading educational institutions and they wrote to my department and said "One of your men was in the Province advocating that the farmer should not air the milk. We advocate the contrary, and we will continue to do so, until we have some reliable authority not to do so." I was rather amused to find that there was not much authority as to whether it should be aired or not, and I came to the conclusion that we should have some reliable authority. Being fortunate enough to have an assistant like Mr. Barr to undertake it, we got the information and you have it to-day, and we intend to carry it along a little further. Next summer we intend to take hold of all the patrons of one factory and have half of them do one thing one day, and the other half do something different, and with two large vats we will be able to find out the yield from the milk in this way. And when we have that, I hope to publish a bulletin on this question in sufficiently large enough numbers to put in the hands of every dairyman in the country.

The CHAIRMAN: I would like to suggest to the Dairy Commissioner, that he should publish a bulletin with this statement for this season. I think it is a great pity that every dairyman of Ontario is not here to see these lantern slides. I know it would be impossible to illustrate the views in the bulletin, but I think the bulletin should be published with figures. It is so important that no time should be lost in placing it in the hands of every dairyman in this section.

Mr. RUDDICK: I think the results will be pretty generally published in the press. We are taking some pains to have that done.

Mr. MACPHERSON: I took a great deal of interest in this valuable address, and I cannot let the opportunity pass without making some remarks. There is nothing that affects the reputation of Canadian cheese with regards to quality, or affects the yield more than a gassy curd. If the flavor of our cheese is affected by this fermentation, and if the yield of the milk is affected injuriously by these gassy curds, and if it is possible to discover a means or method whereby they can be overcome, which has been demonstrated so successfully to-day then you strike at the very first principles of success, and you enhance the quality of our cheese, and you enhance the value, because you increase the yield.

There is no doubt so far as my experience goes, that the yield is deteriorated by gassy curds, and it runs very often from 5 to 15 per cent. Makers know that the whey will be quite milky when you have gassy curds on hand, and valuable material will pass off in the whey and be lost to the farmer and the manufacture, and I cannot express myself too strongly on the importance of this new discovery. We have been told that airing was the thing

for producing milk in the very best condition, and we have the fact demonstrated to-day that cooling is all that is essential. All that is needed is to have the milk kept free from foul odors.

REPORT OF INSTRUCTION FOR 1908.

By G. G. Publow, Chief Dairy Instructor, Kingston.

It is with pleasure that I present to you my sixth annual report as Chief Dairy Instructor and Sanitary Inspector for Eastern Ontario.

The work of instruction and inspection was carried on in a similar manner to that of last season, the only new feature introduced being the appointment of two official prosecutors, to deal exclusively with cases of adulteration of milk, thus relieving the factorymen of a very unpleasant duty. Rather than individualize the work of each instructor, I have prepared a tabulated statement, showing in a concise form what has been accomplished, together with other interesting information pertaining to each district.

The number of instructors and sanitary inspectors employed was twenty four for cheese factories and one for creameries. The cheese instructors had 941 factories under their supervision, and the creamery instructor had 28.

1,723 full day visits were given to the cheese factories. Full days were spent when requested by the factorymen, or when it was found necessary to give general instruction in the manufacture of cheese, or to assist in locating the cause of any defects that might exist, and for a general inspection of the milk supply and sanitary conditions. The factories also received 4,852 call visits, the instructors remaining from half an hour to half a day as occasion required. By visiting the factories at short intervals, and spending some time in the curing room with the makers, the instructors are often able to be of as much service in remedying defects in the cheese, as if they had spent the whole day in the factory. We find this particularly true with makers who have a good knowledge of the principles of cheese-making, but who are liable to be confused owing to the varied conditions in which the milk is received. These call visits have proven to be a great factor in keeping the quality of the cheese uniform throughout the different months of the season, and have proven beneficial to the makers in many other respects. They also enable a more frequent sanitary inspection, and this results in the factories and surroundings being kept in a much better condition than they otherwise might be, if inspection were not so frequent. But the work of inspection was not confined solely to the factory conditions. Considerable time was spent in visiting the farms of patrons. 2,481 farms were visited with a view to improving the quality of the milk supply, and from the conditions revealed by these visits, it would appear that much greater attention should be given to this important feature of the work. It was found at many of the places visited that very little attention was given to the sanitary conditions under which the milk was being produced and kept. At many of these places from which milk was being received out of condition, the instructors demonstrated to the patrons how the milk should be cared for during the warm weather. The milk was divided, and one part was cared for simply by dipping and the other part was covered and rapidly cooled by means of water or ice to a temperature ranging from 65 to 70 degrees. When the milk was received at the factory next day and

fermentation tests made, it was found that the portion cooled by water or ice showed about two one-hundredths per cent. less acidity than that which had been only dipped, and invariably the curds produced were much closer and cleaner in flavor, the difference being most marked in cases where the surroundings where the milk was cared for were unsanitary. It is gratifying to be able to report that in practically every case the instructors were well received, and the patrons visited showed a willingness to comply with the suggestions offered; and we believe, as patrons come to realize how very important it is to produce and care for milk under sanitary conditions, and the losses that are sustained due to the lack of these conditions, the sooner will they be improved.

I am pleased to say that on the whole the quality of the milk delivered to the cheese factories this year showed a marked improvement over that of last, and it is quite evident that, as a result of dairy education, the patrons are taking a more intelligent view of the principles involved in he production and care of milk, and we have every confidence that the improvement will be more marked during the coming season.

The number of patrons delivering milk to the cheese factories this year was 36,801, which is some 1,700 less than last season. This decrease is largely due to the fact that many of the patrons found it necessary to dispose of their herds last season on account of the scarcity of fodder.

The number of cows from which milk for cheese-making was obtained was 340,829, and the amount of milk delivered at the cheese factories from said number of cows, for six months beginning May 1st and ending October 31st, was 459,584 tons, 695 lbs., which gives an average of 2,700 lbs. per cow. The highest average in the twenty-four groups was 3,162 lbs., and the lowest, 1,729 lbs.; but it is only fair to say that many of the factories in this syndicate did not open till about the 1st of June and closed the last week of October, so that the low yield in this syndicate is accounted for by the short factory season.

The average percentage of fat in the milk for six months was 3.65 per cent.

From the milk was manufactured 85,809,909 lbs. of cheese, the average amount of milk required to make a pound of cheese being 10.71 lbs. (Here I would like to express my thanks to the officials of the factories who so kindly assisted the instructors in securing the above information).

The testing of milk for adulteration was also conducted by the instructors, 48,226 samples being tested by lactometer and babcock tests, and of this number, 129 gave indications of having been tampered with. In each of these 129 cases, a sample from the herd was obtained, and a thorough investigation made, and as a result, 114 were handed over to be dealt with by the official prosecutors who were engaged by the Eastern Ontario Dairymen's Association. 108 cases were laid before magistrates, and the parties were given an opportunity to plead guilty or otherwise. Convictions were obtained in all cases except one, and fines were imposed on the convicted parties of from $5 to $50, amounting in all to $2,380, one-half of which went to the Eastern Ontario Dairymen's Association and the other half to the factory in which the offence was committed. No settlements outside the the court were allowed, and it is thought that the publicity given in this manner will have a good effect in stamping out the tendency to tamper with milk. It is to be regretted that so many still persist in this work, and it would appear that the only way to prevent it would be to pay for the milk according to quality; but this will evidently not be in effect for some time, as there were only 87 cheese factories paying by test this season. So long

as the pooling system continues, there will probably be no better way of dealing with the matter than the method which was adopted this year.

It is very gratifying to note the continued improvement in the factory buildings and surroundings. There were 29 new factories built, and 490 made improvements in buildings and plant, the estimated expenditure, including new buildings, being $130,695.

In the matter of sanitation of the factories, the greatest problem we had to deal with was the keeping of the whey tanks in a proper condition. It is quite evident that the condition in which many of these tanks are kept is responsible for many of the objectionable flavors that we find in the milk and cheese. As an evidence of this, in some twenty factories that were having trouble with undesirable flavors, we found that after the tanks were thoroughly cleansed, and kept in that condition, the trouble practically ceased, but where the tanks were made of wood and has been in use for a considerable time, it was found most difficult to keep them in a satisfactory condition. In factories where steel tanks were in use very little trouble was experienced in keping them in a sanitary condition, and they are much to be preferred for this reason. In twenty-four other factories where they were having the same difficulties, and where it was practically impossible to thoroughly clean the tanks, they adopted the system of pasteurizing the whey, and wherever this was properly done no further trouble was experienced with bad flavors. Another great advantage of pasteurizing the whey, other than overcoming objectionable flavors, is that there is a more even distribution of the fat in the whey, and it is delivered in a sweeter condition to the farms. I would therefore strongly advise the patrons, where the whey is returned to the farms in the cans in which the milk was delivered to the factories, to seen that the tanks are regularly cleaned or that the whey is pasteurized.

While the majority of the factorymen responded quite readily to the recommendations made by the instructors, yet some twenty-five persisted in keeping their factories in a very unsanitary condition, until they were instructed that unless they made the necessary improvements at once action would be taken against them; but I am pleased to say that we obtained the conditions asked for without having to resort to this measure. To be fair to the factorymen, I might say that it was not because they did not see the necessity for the improvement asked for, but owing to their small patronage and the low price of manufacture, there was little or no profit in their business; in fact some of them did not have enough to pay the running expenses. It is to be regretted that in this eastern section there are so many small factories that this will apply to, and I would strongly advise that wherever possible two or three be combined and a good up-to-date factory built in their stead. With the exception of one or two districts, the majority of the factories are now in good condition as far as the buildings and drainage are concerned. However, the great majority of them are lacking in good facilities for curing the cheese, as only 49 are so equipped as to be able to maintain a uniform temperature in the curing room throughout the season, which is so essential for the proper curing of the cheese. During the hot weather where there are no facilities for controlling the temperature, heavy losses are often sustained through the deterioration and shrinkage of the cheese in the curing rooms, and besides there is not the independence of market conditions that is possessed by factories equipped with cool-curing rooms, and I believe the lack of these conditions is often responsible for the shipping of cheese so close to the hoops

Regarding the manufacture of butter from the whey, I have to report that there were some 63 factories engaged in it this season, as compared with 14 last season. The yield showed a variation of from 3 to 8 lbs. per ton, the increased yield being obtained when the milk was received in an over-ripe condition and was being delivered every other day. While it is evident that with proper facilities and care in the manufacture good butter for immediate use can be made, yet I am still of the opinion that where the milk is delivered to the factories in a cool, sweet condition and skilfully handled in the manufacture, it will not pay for factories to adopt the practice unless the output is large.

Perhaps the most important branch of our work, and the one upon which our success mostly depends, is the quality of the cheese; and while there are quite a number of cheese being manufactured that can be classed as second grade, yet it is gratifying to be able to say that there is a gradual and decided improvement in the average quality, and notwithstanding the critical inspection this year there was a marked decrease in the number of claims.

Here I would like to commend the Montreal merchants for the fair manner in which they treated the factorymen in this respect. Very seldom were whole consignments faulted, but in several cases where whole shipments were objected to, it was found that a few cheese were responsible for the claims made, and if factorymen would adopt the plan of numbering the boxes of defective cheese, and acquaint the buyer of the same, it would result in the docking of only the cheese that are deserving, thus preventing much confusion and dissatisfaction. Here I would like to thank Mr. Burgess, the official referee, for the prompt and efficient manner in which he reported on the defective lots he was called upon to examine, which enabled me to immediately acquaint the instructors with the existing defects, so that they were able to give prompt assistance to the makers who were in difficulty.

The defects that were most common in the defective cheese were openness in make, coarseness of texture, and flavor not clean. Very few complaints were made regarding the finish and boxing of the cheese. The improvement in this respect has been very marked, and while the majority of the makers are capable and are doing good work, yet there are quite a number who are indifferent and lacking in ability and experience. Of the 941 who were in charge of the factories this year, only 301 have received any dairy school training, and of this number only 75 hold certificates or diplomas from any of our dairy schools.

I would strongly recommend the cheese and butter makers to take at least a short term in one of the dairy schools each year, and thus take advantage of the opportunities afforded by the Department of Agriculture, of getting a knowledge of the scientific principles of dairying, of which it is so essential they should be possessed to enable them to deal successfully with the dairy problems with which they are being continually confronted.

Regarding the instructors, I would like to express my appreciation of the manner in which they performed the duties allotted to them. They have put forth their best efforts to bring about improvements in their respective districts, and as a result, more substantial improvements that will tend to the uplifting of the dairy industry have been made in 1908 than in any previous year.

Before closing I would like to express my appreciation of the ready assistance that the directors of this Association have at all times given to the instructors and myself in our efforts to improve the quality of our dairy products and the conditions surrounding their manufacture.

Syndicate.	No. of factories in your group.	No. of full day visits given.	No. of call visits given.	No. of patrons.	No. of patrons visited.	No. of cows from which milk for cheese making was obtained.	Average yield of milk per cow for season.	Average percentage of fat in milk from May 1st to Nov. 1st.	No. of lbs. of cheese made from May 1st to Nov. 1st.	No. of fermentation tests made.	No. of tests for adulteration.	No. of samples adulterated.	No. of factory meetings attended.	No. of factories which pasteurized the whey.	No. of factories manufacturing whey butter.	No. of factories paying by test.	No of curing rooms in which the temperature can be controlled.	No. of new factories built.	No. of factories which made improvements in the building or plant.	Estimated expenditure for improvements, including new buildings.
Alexandria	37	60	150	1,020	20	10,145	2,557	3.70	2,501,975	111	927	2	1	....	....	3	....	1	15	$3,260
Almonte	41	87	131	1,752	119	15,356	2,317	3.72	3,244,094	308	1,885	3	9	2	....	2	....	1	40	8,500
Belleville	40	94	136	1,967	106	17,723	3,051	3.69	5,012,803	70	5,461	5	4	1	....	....	6	1	8	6,200
Brockville, E	45	87	246	1,774	47	18,099	2,853	3.54	4,694,222	67	1,539	1	4	8	7	1	1	8	35	21,697
Brockville, N	44	77	224	1,094	65	14,927	2,800	3.65	3,799,690	98	1,365	....	....	....	2	....	1	3	15	7,450
Brockville, W	42	84	207	1,034	105	14,580	3,104	3.62	4,125,881	268	2,079	5	....	....	1	4	3	....	42	7,360
Campbellford	39	79	200	1,623	65	16,295	3,162	3.50	4,644,604	156	3,400	9	11	....	....	....	3	1	21	6,175
Chesterville	37	42	364	1,130	32	11,180	2,830	3.50	2,801,779	54	888	1	2	2	3	12	1	....	30	4,000
Cornwall	36	60	238	1,500	100	13,008	2,625	3.95	3,480,730	100	1,164	15	....	1	1	15	1	2	30	6,680
Finch	38	71	146	1,209	204	11,534	3,014	3.55	3,210,967	96	1,396	6	20	....	2	....	2	1	11	2,925
Kemptville	42	107	216	1,643	169	15,637	3,546	3.65	3,652,468	49	1,731	6	15	....	3	9	....	1	23	6,468
Kingston	38	100	139	1,308	67	13,598	2,768	3.55	3,465,509	69	2,975	10	....	1	2	....	....	2	3	3,600
Lindsay	40	31	163	1,710	79	11,829	2,413	3.67	2,605,508	47	1,790	1	11	....	2	4	....	1	10	3,000
Madoc	36	90	109	1,017	115	10,449	2,304	3.83	2,266,359	162	540	6	9	....	....	....	2	....	12	2,300
Morrisburg	40	68	220	1,247	110	12,470	2,751	3.51	3,402,626	330	1,210	7	4	5	11	3	....	....	15	1,500
Napanee	40	68	178	3,003	95	25,525	2,818	3.65	6,829,632	120	5,750	7	3	....	....	....	3	....	20	2,300
Ottawa	39	77	148	995	11	10,369	2,372	3.52	2,300,354	141	1,236	3	3	....	4	8	....	3	15	8,805
Ottawa, E	38	92	190	1,175	50	11,838	2,505	3.85	2,869,865	75	2,300	4	5	3	4	9	....	....	25	2,052
Ottawa, W	37	45	207	1,700	300	14,225	1,729	3.57	2,320,000	301	1,200	7	3	....	1	3	5	1	30	6,526
Perth	38	39	185	1,611	105	11,165	2,678	3.70	2,795,495	119	832	2	6	1	3	....	....	2	12	3,565
Peterboro	34	60	330	1,653	501	12,617	2,804	3.54	3,198,963	24	1,729	9	12	....	5	12	3	....	30	4,206
Picton	36	40	285	3,100	95	24,565	2,761	3.75	6,435,175	101	3,472	5	5	....	11	....	14	....	25	7,050
Plantagenet	46	59	221	1,309	56	10,575	2,906	3.84	2,926,757	207	1,820	10	6	2	....	1	3	1	17	4,076
Vankleek Hill	47	97	217	1,207	65	13,170	2,569	3.56	3,224,463	125	1,507	5	3	....	....	1	1	....	6	1,000
Totals	941	1,723	4,852	36,801	2,681	340,829	2,700	3.65	85,809,909	3,198	48,223	129	136	26	63	87	49	29	490	$130,695

A MEMBER: Have there not been more gassy curds this year than usual?

Mr. PUBLOW: No, we have had less gassy curds this year than we ever had, generally speaking. The main difference was the flavor; we had more objectionable flavor.

Q.—What size factory would you advocate to equip for the manufacture of cheese and butter?

A.—I would not advise the manufacturer to equip, unless they had ten thousand pounds of milk a day.

Q.—Have you made any experiments of the sediment at the bottom of the whey to ascertain the amount of butter fat that sediment holds?

A.—No; I sent a sample to Kingston, and found from Mr. Walker's report that they found quite an amount of caseine in the whey.

Mr. PUBLOW: I might say that the average loss in Eastern Ontario is .22. We carried on tests, and we found that some factories were having as high as .41. We also found during the months of September and October that we had a very warm fall, and the loss in fat was very heavy.

A MEMBER: We got twice as much butter in October as we had in May and June.

Mr. PUBLOW: If the milk is delivered in a good condition, cool and sweet milk, it would never pay to skim the whey. We had a number of factories that had a loss of only .15.

ANOTHER MEMBER: Don't you think the tendency is for a great many makers to lead themselves to believe that they can save a great deal of fat by careless handling?

Mr. PUBLOW: I think if you have large losses in the fat, you will also have large losses in the caseine. When you have sediment or fat in the can it is due to one of two causes; you have lots of caseine or you are running out curds in your strainer. Your milk was working fast and the only way for you to do would have been for you to have knocked it about and give it rough handling. There is a greater loss of fat in the whey where you have over-ripe milk. I would like to know if many makers have much complaint to make in the milk in May and June this year? I never saw better cheese in Ontario than there was in May and June of this year. Take the Campbellford district. A few years ago they were noted for acidy cheese of poor quality, but last season during the worst part of the season, I inspected nearly every factory in the district, and with the exception of two factories, no man could point to any fault with the goods. The people in that district were simply sending milk in good condition. That is not due to any one man, but it is due to the individual effort of the people themselves. I would say right here that the makers of this country can do a great deal more than they are doing. There is a lot in the man in charge of the factory. It is not because the factory is small. You can make just as good cheese in a small factory as you can in a large one, but invariably the man in charge is not as skilled as he should be, and the competition is so great that they take in milk that they should not. I would say to the people that are taking good care of their milk to hold the maker responsible for the defective cheese.

Q.—Do you believe in paying by the test?

A.—I certainly do.

Q.—How is it that there are only twenty-eight factories in Eastern Ontario paying by the test?

A.—I would say that from the knowledge we have of the ability of the cheese-makers to do that work, it would be best to go slow, until you have men better qualified to do the work. I believe it is largely due to the lack

of men who are able to do the work properly that so little is practised to-day.

Q.—Would you advocate paying by straight fat or adding to it?

A.—I would say pay by the straight fat. From the tests made in Ontario to-day, there is not much danger of any man having his milk so rich that much injustice will be done by paying by the fat test.

Q.—In the sections where the tests are tried, and most of the factories are paying by tests, and these tests make 4 per cent. and 3 per cent., what was the difference in money value?

A.—In one it was $1.30 and another $1.00. The man that sends 325 lbs. of 4 per cent. milk would be giving away one dollar of his money to the man who sends 3 per cent. That is the way you are doing.

Q.—How is it that makers are not qualified to do this work?

Senator Derbyshire: Possibly I can answer that question. In the Madoc district a maker lost the factory that he had been running for nine years. The farmers let the job out by contract to the lowest bidder, and this man lost the factory because he would not make it for a quarter of a cent less, or, to be accurate, a quarter of a mill on the dollar. The man they have hired is not competent to make cheese, and the man they turned out was a first-class man. How are you going to get the best men in the business, if you are going to skin them down to a mill on the dollar.

The Chairman: This is opening up a very large question, and the dairymen of this country ought to take it up. We are criticised through the country because we are interfering with the rights of the citizens and the rights of the dairymen. I have read some criticisms that are so absurd that so far as I am concerned as President of the Association I thought it beneath me to reply to them. They say these Associations are sending men to the barnyards of the farmers to look them over and tell them what kind of people they ought to hire; and that we interfere with the rights of British subjects. Of course if trying to raise the standard of the work is interfering with the rights of British subjects, then we are doing that. They do not want us to say to them you must have a better cheese factory; they do not want us to say to them, you must have your milk in better condition and keep your stables in a sanitary condition. Sooner or later, if we do not mend our ways, this is bound to come back on us, because if the Englishman gets it into his noddle that we are making our cheese in an unsanitary condition, then the same trouble that arose from the meat curing in Chicago will come back on us, and if we do not keep our reputation in England, what does it mean to this country. I say it is our duty to see that every factory in Ontario that is sending a pound of cheese out of this country is making the best cheese that they can make. If a number of factories are allowed to send poor cheese out of this country, they will destroy the reputation of Canadian cheese.

We now have legislation and we can close up factories that are not kept in proper condition, and Mr. Publow under the direction of the Association has done so. At the present time every instructor is clothed with that authority. We have tried moral suasion in order to convert these people, and we are working along these lines in order to raise the standard. We cannot do this unless we have the dairymen of this country behind our backs. When you hear these criticisms, I want you to understand that we are doing what is right, and we are doing it in the interests of the people of this country. We want your sympathy, and your interest, and we want you to stand behind our backs and help us to carry out what we are trying to do. (Applause.)

Mr. John Singleton: I would not like to take up any valuable time this morning, but I cannot allow this opportunity to pass without saying a work in connection with the valuable information we have received this morning. I take it that this morning's meeting has been the most valuable meeting I have attended in connection with this Association work during a number of years, and I think the dairymen of this country are placed under a great obligation to our Dairy Commissioner, Mr. Ruddick, for carrying out in such details the information he has given us this morning. When scientific people come in and demonstrate the fact that what we were doing a number of years ago is not the proper thing to do, then we should take advantage of the information we receive. We should have a uniform method of instruction and a uniformity among instructors to educate the farmers as to how to take care of their milk. A lot of valuable time has been lost in dipping milk and in airing it. and now we find there is nothing to do but to milk in proper condition, cool it down, cover it up and then let it alone. One authority teaches one thing, and another authority teaches a slightly different thing, and we do not know which to do. I hope in the future that the authorities will come to a definite conclusion on a subject they are going to place before the public, and be sure they are right before they give it to the people.

Speaking of paying by the test, one thing came up a few years ago, that placed more cold water upon that than anything, and that was when one authority at one end of the Province said one thing and another authority said another, and the matter had to be decided by the farmers as to which was right. It is an open question to-day, and until that is decided, and settled conclusively there is no use talking about paying by the test. I hope this information we have to-day will be hammered right home on the minds of our milk producers.

DAIRY BACTERIOLOGY.

By Wm. Connell, M.D., Kingston.

It is with much pleasure that I address this meeting to-day, as this is my home county and in this town I received my High School course.

Seeing that my work is limited to one portion only of the problems of dairying, I must of necessity in my addresses cover much the same ground year after year, varying the text if not the sermon.

By way of introduction let me point out that in the manufacture of cheese the maker is concerned in the control of a series of fermentations, upon the proper action and direction of which will largely depend the character of his product, certainly in so far as flavour and texture are concerned. This holds true, though not nearly to the same extent, in butter making. In cheese making the fermentations are partly those due to the action of unorganized (non-living) ferments or enzymes (such as rennet), and partly to the action of living ferment bodies which are found to be certain bacteria. Both these forms of fermentation are found to be essential in our process of cheese making. Thus good rennet is a necessity, for not only does it curdle the milk but its action is requisite for the proper ripening or curing of the cheese. More stress than is even now laid upon this matter will be found necessary in the future, and there should be some facilities provided by which the qualities of a rennet could be determined, as, to my knowledge, none exists now.

It is, however, with the second class of ferments—the living or organized ferments—that I wish to particularly deal this morning. In our process of making cheese it is necessary to develop acidity, first in the milk and later in the curd. This acidity is produced by the fermentation of part of the milk sugar into lactic acid by the action of certain bacteria. In this development of acid certain other products are formed which have largely to do with the flavour of the cheese. Why should it be necessary to develop this acidity? Largely for the reason that the curing ferment (pepsin) of the rennet requires acidity for its action and without acid the curing changes would be practically nil. But there is an additional reason why acid development proves advantageous. It is that acidity checks the development of most kinds of bacteria having to do with decay or decomposition so that the acid development adds materially to the keeping qualities of cheese and keeps cheese from decomposing. (I do not wish it to be inferred by any one that acidity cannot be overdone, however.)

Before proceeding further along these lines it would be perhaps better to make some general remarks on bacteria so as to make those present better acquainted with them. These bacteria are very minute plants, in fact practically the smallest forms of living (organized) matter definitely known. They are much smaller than the average fat drop in milk, so that it is hopeless to think of straining them out. There are known to be many hundreds of different kinds of bacterial plants, and these different species have so adapted themselves that they are found almost everywhere; so that air, soil, water, milk, our clothing, the surface of our bodies, etc., will always be found harbouring some kinds of these germs. But simply because bacteria are found it by no means follows that they are harmful or even are of importance, though no doubt all have some function, some purposes if you will, for existence. Thus certain kinds are found to be active in the production of disease in man and animals; other forms are very important agents in the soil in forming or building up food stuffs for higher plants; other forms again are actively engaged in the processes of decay, decomposition, putrefaction or rotting, whether of dead plants or animals; still others are important agents in the production of certain fermentations such *e.g.* as the making of vinegar. All these, while of great import in their way, are not being discussed to-day, the ones of interest to-day being those bacterial forms which can, when they gain entry to milk or its products, thrive in them and bring about changes. Now these changes are mostly of fermentative character, but some are true decomposition changes (these are of course closely allied).

I have said that bacteria are plants, and like other plants they require certain things for their growth and reproduction, the main requirements being suitable food, moisture and temperature. The food required will vary with the kind of bacterium, but milk is unfortunately a good food material for a considerable number of bacteria, and of course it possesses the requisite moisture. As to temperature, bacteria differ in their requirements but with milk it may roughly be said that the nearer the temperature goes to 100° F. the more rapid the bacterial development; while with fall of temperature growth is slowed, *e.g.* at 60° F. takes 3 to 8 times as long to develop as at 95-100° F., at 50° F. takes 8 to 15 times as long; while at freezing point all growth comes to an end. By controlling the temperature of milk there is placed in the hands of the patron a means of controlling bacterial development, a means which is secondary only in importance to that of prevention of seeding of the milk by employment of cleanly methods.

I have already pointed out that the development of bacteria capable of producing acidity with proper flavour production is not only an essential but a necessity in our process of cheese making. Now this development of acidity in milk is the natural change noted in milk when kept in this country; that is, the milk sours, and this is due to lactic acid production by certain bacteria, and the acid production in cheese making is merely a like process controlled and modified by other fermentations. Acid producing milk bacteria are thus widespread, and under ordinary conditions are generally found in the milk. Not all acid producing forms are, however, desirable, as a number of these forms while producing acidity combine with this the formation of bad flavours, of gas production and the like, and are even more deleterious to cheese than would be the entrance of many non-acid producing bacteria. It is the duty of the cheese-maker to foster the growth of the proper forms of acid bacteria, and it is the duty of the patron to furnish milk free from undesirable forms of these bacteria. The milk of one or two patrons containing these undesirable forms will when introduced into vat make trouble for the whole lot of milk contained therein. It is a case at such times of sowing tares with wheat, the wheat may have gained such headway that the tares are not much remarked, though still there, or on the other hand the tares may choke out the wheat. The patron or maker who knows nothing about bacteria may well ask how is he to know if such germs are present? To this I can only answer that the only practical test applicable to every-day practice is that of the nose, reinforced by sight and taste; their presence is made known by the results produced only. Of course fermentation tests or even a bacteriological examination can be made, but these consume time, and it is up to the maker to dispose of the milk when it is presented at his doors. It is very essential then for the maker to develop a discriminating nose and a seeing eye. It is my duty and that of other investigators to point out that these undesirable changes have their cause in the presence and growth of undesirable forms of bacteria. The maker notes the conditions produced in the milk and the alterations in product, I and others have to examine into the causes, their methods of action and to try and devise means that will lead to their elimination.

In examining milk and cheese the main forms of undesirable bacteria found are certain forms which while producing acid (some of them abundantly) also produce certain evil by-products such as gases, bad flavors and the like. Now such bacteria come mainly from manure and manure laden dust. This manurial dust falls from the udder and sides of cows during milking; is found on hairs and is in the dust of stables, barnyards and roads. Such bacteria if they gain headway in milk are of course also present in increased numbers in ordinary whey, and when cans are used to carry home whey, if cans are not thoroughly cleaned and scalded, will be an important source from which seeding can occur. Cleanliness of the whey tank assisted, if necessary, by pasteurization will largely remove this source of trouble. A rather common practice, and one which is decidedly objectionable, is that of leaving pails used for the evening milking unwashed and exposed in or near milking places, and thus certain to acquire and retain a dust coating, especially when windy or when exposed to dust raised by animals in passing. Practically one finds that the seeding of milk with undesirable bacteria is due to some lack of cleanliness during milking, or in care of milk and milk utensils. I am not going to dilate here on the factors necessary for cleanliness in milking and handling milk, but would point out that as the strength of a chain must be gauged by that of its weakest link, so lack of care in one particular may neutralize care in all

others. The gist of the matter lies in this, that cleanliness in all particulars—of milkers, of animal, can and pails and of milk stands—plus care in cooling of milk, will assure at all times a good wholesome milk to our factories.

There are several matters connected with our household and dairy work that I would like to speak a little more particularly about this morning; these are the common fly, and water supplies at farms and factories.

The common fly has always been considered an annoying insect; but with a better knowledge of its life history we can add the additional fact that it is at times a disease carrier. The fly breeds in manure commonly, less frequently in decaying food, so that the presence of considerable numbers of flies in a house or factory means always the presence of filth somewhere in the immediate neighborhood, a condition of affairs which should not exist. Further, the habits of the fly are not of the cleanliest, as most of you are aware. It is not averse to crawling over a mass of filthy excreta, and then trailing over a dish of food or a bald head if either of these are convenient; or in a factory taking a bath in the milk, etc. Disease-producing bacteria have been carried in this way, particularly the bacillus of typhoid fever, and I have traced to flies one serious tainting of cheese in a factory in Northumberland Co. As an instance of the numbers of bacteria the common fly will carry, let me quote you the figures given by Prof. Easton, of Cornell University, as they are very interesting.

Prof. Easton caught 100 flies in a kitchen, put them in a pint of sterilized water and rinsed them about, and then examined the water, and found that he had raised such a number of bacteria off that each fly averaged over 300,000. He next caught a similar number in the cow barn and they averaged over 800,000 each, another hundred in the pig pen and they averaged over 1,000,000 each, a fourth hundred were caught about the swill pails and they ran up to 1,500,000 bacteria apiece. Do you wonder that some of us object to seeing flies in the milk jug. I think I can say that when one goes into a factory or a house and finds many flies, one is immediately justified in condemning the sanitary surroundings of such premises. One, too, can appreciate the fact that in factories where flies abound it is next to impossible to keep them out of the milk, and the seeding of the milk by the bacteria which they carry must be very appreciable. It is ten years ago now that I first brought this matter to the attention of the dairymen, but it still needs emphasizing, as too many seem to think the fly a necessary, if annoying, evil; but truth is the fly serves no good purpose or serves a purpose which can be better performed in other ways.

The other matter which I desire to discuss before bringing this address to a close is that of water at farms and factories. The ideal drinking water of most persons is the clear, colorless, sparkling water of a spring. So strong a hold has this ideal that it is very difficult to convince the average person that water having these characters can at times be other than wholesome, and conversely, that water lacking in any of these qualities is suitable for use. The origin of this idea is not far to seek, for early settlers in this country drank such water wherever they found it, and found it to be good. Wells were dug as near the door as possible with a full belief in the purifying properties of mother earth. Factory wells are often just outside the factory or even in the boiler room. Now when the soil is virgin, and when waste of man, animals and of manufacturers is not thrown out on the ground in the neighborhood (and this may mean 50 to 250 feet according t well or stream situation and trend or dip of country) of well or stream, then confidence in such water was justified. In other words so long as the

collecting area of the water supply is kept free from waste of human and animal life, so long will a water supply be safe, for as a rule the dissolved mineral and vegetable substance in water are harmless. But is it common practice to so protect the collection area of a well about a house or factory? In 90 per cent. of the cases the reverse is true, and we have as a people been so far exceedingly careless in the disposal of our wastes—the slop water of houses, the drain water of our factories, even the excreta of man, and most certainly very careless in the disposal of the excreta (manure) of animals. The result of such carelessness is that very often wells and springs and streams become more or less polluted with these wastes, and must then be classified by sanitarians as "potentially unsafe." They may not actually lead to disease production in man or animals; in fact unless the specific disease agents are present, such waters will not carry disease; but the point is they are polluted, and while the polluting material to-day may be quite harmless, to-morrow it may be dangerous. In the same way at factories, when factory or other waste gains entry it may not seriously interfere with the water for cleansing purposes or it may become a dangerous menace to the purity of the butter and cheese made therein. Let me point out that in one common type of well in this section of the Province, *i.e.* the surface well, that the origin of the water in the well is the "ground water," this being the water absorbed into the soil and passing downward till held by an impermeable stratum or layer of rock or clay. At times this water is high, that is, the soil has absorbed such quantities that it fills up all the interstices of the soil and may reach to or above the surface, as is seen not infrequently in the spring of the year or after very heavy prolonged rains. This ground water flows very slowly in the direction of the "dip" of the country. A well is simply a collecting pit for this water, and rises and falls with the ground water. Ordinarily the more water used from a well the greater will be the drainage area of the well, and in dry seasons a well may be draining the ground water for several hundred feet about it. Now the water as it passes through the soil carries down with it much of the waste on the surface, at least, all the soluble portion and the finer particles such as bacteria, etc. The soil through which such water passes undoubtedly filters this water, but much of the material may pass impurified though cleared and looking bright and sparkling, and may appear in the well or spring; for springs are simply places where the ground falls away so that the holding layer of rock or hard-pan comes to surface and the ground water flows out above it. Now what is the condition of the water in our wells in this country? Prof. Shutt, of the Experimental Farm, has said that the majority of the farm well waters submitted to him for analysis are but little better than cesspools. My own experience of well waters from farms, villages and factories unfortunately shows Prof. Shutt's statement to be well founded, as during 1907 and 1908 I have made an analysis of 299 samples of well or spring water submitted to me and of these 175 were contaminated with bacteria of intestinal origin. In other words they contained bacteria which originated in the intestines of man or animals, and hence were classed as "unsafe" waters. This is a percentage of 58.8 per cent., a high average, of course, but I regret to state that the factory samples sent me when considered alone averaged over 65 per cent. polluted with factory waste or with excretal bacteria. Of course the samples sent me were sent for the most part because they were under suspicion, but decidedly this percentage is too high. It means that we have been very careless about the disposal of our wastes—that it is time we wakened up to the fact that we must provide better drainage about our farm houses and factories and protect the drain-

age area of our wells and springs from pollution. This is essential not only from the health standpoint, but from the dairy point of view, because not once but on numerous occasions defect in butter and cheese has been traced to polluted water at dairies and factories.

I am, to-day, simply asking that the doctrine of cleanliness, preached for years as essential in factory and in care of milk, be given a little wider extension, and that it rid us of our fly pests and of our polluted waters.

ADDRESS.

By J. H. Wilson, Saskatchewan Dairy Department, Regina.

I did not come down here to take up any of your time. I merely wanted an opportunity to sit in the audience and learn a little. I have been separated from the dairymen of Ontario for quite a number of years, and I am glad to meet so many old faces here to-day. It is ten years since I went West. I have had an opportunity of attending these conventions once in three years, and it always gives me a great deal of pleasure. I have listened closely to the addresses given yesterday and to-day, and I am sure I will return West better fitted for my duties.

When it was suggested to me by the Commissioner of Agriculture and the Deputy that I should come to Ontario to attend the Eastern and Western Convention, I did not hesitate to accept. In addition to that, I asked for three months' leave of absence, and during these three months I intend to spend the time at the Guelph Agricultural College, to better fit myself for the duties that lie before me.

Senator Derbyshire does not hesitate to put forth the claim that Brockville district is in the lead, but I want to tell the worthy Senator that in the course of a few years we will have something in the West that will give Brockville a close run. Saskatchewan is considered the infant dairy province of the Dominion. In my work in the West I am profiting by my work in Ontario, and I am trying to avoid the ruts you have fallen into.

We are advocating centralization. Very stringent regulations have been passed, which I think have served a good purpose. We have very good control of the co-operative dairy industry of Saskatchewan. The regulations provide that no dairy can be erected without plans and specifications being first approved, and no creamery can be erected within twenty miles of an exis ing one, and no creamery can be erected until the site and plans have been approved by the Department of Agriculture, and we also have a clause in our Act which provides that a shareholder who is not a patron cannot receive more than 5 per cent. dividend on the money invested. We met with great difficulty in the early history of the Province by our townspeople and merchants advocating the establishing of creameries. They invested their money and very few farmers took stock. The townspeople were safe because they drew 8 per cent. and in one case 9 per cent. As it is now, there is not much danger of a merchant in town advocating a creamery, when he knows he cannot draw more than 5 per cent. We have adopted centralization to such an extent that the Government pays all the express charges on all the products, and the farmer who lives 100 miles gets the same profit as the one who lives near the market. Last year we had 37 applications for creameries and only one creamery erected. This year we had 18, and so far it has not been decided to build any creameries.

In conversation with the Commissioner of Agriculture, before I left Regina, he said he was afraid the farmers would become too enthusiastic about co-operative work, and we would be unable to prevent the erection of creameries that we thought would not be successful. I made the statement that where I could get a party of farmers together to discuss the situation with them and present the policy of the Department, that in nine cases out of ten they would side in with the Department, and discourage the erection. In the year 1907 we had a struggling existence. In fact, I despaired as to whether we would be able to get the best of our creameries going. In the agreement of the various associations with the Province, the patrons must bear the actual expense. The Government undertakes to sell the product, and that is done free of charge, but the patrons must bear the actual cost of the manufacture. That year it cost the farmers in one of our small creameries ten cents a pound to manufacture. In 1908 we were able to increase the amount 225 per cent., and the highest cost of manufacture was four and one-half cents, and two creameries have manufactured for less than three cents.

Our revenue from dairy products is nothing like what it is in Ontario. We are in the state Ontario was in thirty years ago, but in time you will hear from Saskatchewan. The products last year from creameries amounted to 400,000 pounds of butter and the revenue derived was practically $1,000,000. Next year I look for an increase of 50 or 100 per cent. We have introduced the travelling dairy school, and last year we had special dairy courses that travelled throughout the whole Province; and in addition to this we are endeavoring to assist the farmers to secure a record of each individual in the herd. Early settlers in Saskatchewan devoted their farms to wheat growing, because that was what the land was best fitted for; but now other portions have been opened up that are well adapted to dairying, and there is no doubt it will increase. (Applause.)

Q.—What does the farmer receive now for a pound of butter?

A.—The average for creameries in our control for last year was somewhere over twenty-two cents; that was the net return to the farmer.

Q.—Is that for butter or butter fat?

A.—Butter fat.

THE DAIRY SITUATION IN EASTERN ONTARIO.

By J. A. Ruddick, Dairy and Cold Storage Commissioner, Ottawa.

It is now twenty-six years since I first came into close touch with the dairy industry of Eastern Ontario, as Superintendent of the Allengrove combination of cheese factories, in the Counties of Glengarry, Stormont, and Prescott. A large number of the factories in that part of the country were started in the eighties, so that my connection goes back to the early days of the industry, and it is quite natural that I should have watched the development of this section with particular interest. In the spring of the year 1889 I quit the manufacturing end of the business to take up educational work, at the invitation of this Association, for it was in that year that Mr. Publow and I were appointed instructors for that part of Ontario east of Kingston, my particular territory being all east of the Brockville and Ottawa Railway line. For two years I covered the whole of this large district, but it must be obvious to anyone who knows the country that my efforts were

necessarily spread rather thinly where so much ground had to be gone over. Since joining the Dominion service in 1891 I have come into contact with other phases of the industry, and more particularly with its commercial side and the problems connected with storage and transportation. I have had exceptional opportunities, through access to literature, travel and personal contact with experts from all over the world, for acquiring information relating to the dairy industry in its various aspects, both productive and commercial. I make this rather personal reference to establish my claim, as it were, to speak with some authority on the dairy situation in Eastern Ontario, with particular reference to the extreme easterly portion of it.

I shall confine my remarks to the cheesemaking branch of the industry, not because the buttermaking branch is of no importance to those engaged in the manufacture of cheese, but because the inclusion of both branches would make the subject too large for this paper.

Eastern Ontario, viewed from the standpoint of cheese production divides naturally into three main districts, each with certain features which distinguish it from the others, and which for the present purpose may be designated as Central Ontario, Brockville and Eastern districts. The Central Ontario district, which includes Prince Edward, Hastings and Peterborough Counties, and of which the old Belleville district was the beginning and is yet a kind of natural centre, was the first part of Eastern Ontario to win prominence in the cheesemaking industry. The cheese from this district early acquired a good reputation on the British Market, and the Belleville district was recognized as leading Eastern Ontario twenty-five or thirty years ago.

The factory system was started near Brockville about the same time as it was in the Belleville district, but the development was somewhat slower. The limits of the Brockville section have never been very clearly defined. It is said that at times the boundaries have been stretched to take in a good part of Eastern Ontario. It has even been hinted that portions of the Province of Quebec have been included,but we are not concerned with that phase of the question at present.

The third or eastern district embraces the territory included in the Ottawa Valley and the Counties of Glengarry, Stormont and probably Dundas, or, in other words, the country lying north and east of the Brockville section proper. This was the last part of Ontario to engage in dairying extensively, and probably the most notable feature of the development of the industry in these counties was the organization of large combinations of factories under one management. The Allengrove combination of factories, now broken up, was the largest ever known in the history of cheddar cheesemaking. That combination, along with several others, at one time practically controlled the manufacture of cheese in these counties. It is not unreasonable to suppose that the combination plan of organizing the factory end of the cheese business has had some influence on the progress of the industry in a territory where it was so generally followed. The system has many advantages, especially where conditions tend towards small factories. It also has some disadvantages and one is that the patrons and the management are not brought into close contact with each other, with the result that the patrons do not learn to take the same lively interest in the business as they do where the co-operative or single proprietary factory systems prevail. In one respect the pioneer factory-owners of the eastern district, although they are deserving of the greatest credit for their early enterprise, made a serious error in adopting a low standard for their buildings and equipment. This gave the section a bad start, from which it has never

recovered, for we still find in the extreme eastern counties the poorest buildings and the most unsatisfactory conditions surrounding the manufacture of cheese which are to be found in any part of Ontario.

It will be interesting at this point to consider the extent and distribution of the cheesemaking industry in Eastern Ontario. According to the returns of the Census and Statistics Office for 1907, the counties lying east of York and Simcoe, but not including these two, produced in that year 104,367,739 pounds of cheese, valued at nearly $11,000,000, or considerably over two-thirds of Ontario's total output. We find that the business of dairying is most extensively followed in the eastern group of counties, which, including Leeds and Carleton, are credited with about one-third of the total production of cheese in Ontario. The exact figures for the Counties of Leeds, Grenville, Dundas, Stormont, Glengarry, Prescott, Russell and Carleton are 49,404,287 pounds, valued at $5,760,55. the County of Dundas produces more milk per acre than any other county in Canada, the value of the cheese from that comparatively small county in 1907 being over one million dollars. No other section of Ontario is so largely devoted to dairying as that which comprises the counties in the extreme east. The farm revenues depend more on dairying in this district than they do in any other division of the Province. In the counties bordering on Lake Ontario, fruit growing, the canning industries and beef raising divide the attention of the farmers to some extent, and in Western Ontario the diversity of farm industries is even more pronounced.

Referring again to Central Ontario, I have already stated that this district was a leading one some years ago; but having attained that position, the dry rot of contentment began to take effect, and before many years the Belleville district was obliged to yield the banner to the Brockville section. I am not sure that my Belleville friends will admit this, but that is the way it looks to a disinterested observer. There is more to be said in this connection, however, because as soon as the dairymen of that district realized that they had lost the place of honour, although it took some years to convince them of the fact, they immediately set about putting their house in order, with what result we shall see as we proceed. The beginning of the cool curing movement found the district in a receptive mood, and this means of recovering their position has been adopted to such an extent that within the past five years a large number of the factories in the Counties of Prince Edward, Hastings and Peterborough have been equipped with cool curing rooms. In this important reform the district easily leads Eastern Ontario, especially in Prince Edward County. Every cheese factory in the Township of Ameliasburg is now equipped with a cool curing room. I am informed that the one factory which did not adopt the improvement has closed its doors and the milk will go to the others. All told, there are thirty cool curing rooms in the Central Ontario district. I would not have you think that I look upon cool curing as the whole thing in progressive cheesemaking; but I do look upon it as a very important factor in determining the reputation of the cheese of any particular district. I am only repeating common talk in the trade when I say that the Central Ontario district, especially the Picton section, has come rapidly to the front again since it adopted the cool curing system so generally.

Now let us see what has been doing meantime in the other districts. I find that there are only seven cool curing rooms east of Kingston, all of which may be credited to the Brockville section, because there is not a single one, as far as I know, in the eastern district.

I am afraid it is a case of history repeating itself, and that the dairymen of the Brockville section have, like their brethren of Belleville at an earlier period, already mentioned, been relying on past achievement rather than on present effort, and in consequence they have been standing still while other districts have been going ahead. I say this with all kindliness and without any intention of giving offence to my friends in this district. I ask them to bear in mind that I am quoting actual facts, not opinions, in support of this conclusion. I am not responsible for the facts.

Another matter has attracted my attention in preparing this review of the dairy situation in Eastern Ontario, which I think is worth mentioning. Members of the Convention are aware that the Branch of the Department of Agriculture over which I have the honour to preside has for several years been encouraging the organization of cow testing associations for the purpose of studying the performance of individual cows. Many people think this movement is calculated to add more to the profits of dairying than any other scheme which has ever been proposed with that end in view. I need not go into details, because the subject has been ably presented by my assistant, Mr. Whitley. It will be sufficient to say that there are 20 of these associations in existence in Eastern Ontario. Of this number 14 are in the Central Ontario district, which leaves only 6 east of Kingston, although the same effort at organization has been made in all parts of the country. These two movements, the cool curing of cheese and the improvement of the dairy herds, strike to the root of profitable dairy farming, the one by increasing the yield per cow, the other by improving the quality of cheese and thus insuring a good demand at a higher level of prices. For these reasons they deserve the careful attention of all dairymen.

Now we come to a point which should be emphasized. I have tried to show you that these three districts of Eastern Ontario have been progressing along certain lines in inverse ratio to their dependence on the dairy industry.

Does it not seem remarkable that the farmers who derive the largest proportion of their revenue from dairying appear to the ones who are giving the least study to questions affecting their interests? I put it that way because it can be nothing but a lack of information which results in such backwardness as I have described. No intelligent man can have any doubt as to the value of the cool curing of cheese, or of the keeping of records of his dairy herd, once he is in possession of all the facts bearing on these questions.

Mr. Whitley has given you some facts concerning the testing of dairy cows, and I ask your indulgence while I give you some of the facts in regard to the cool curing of cheese. My own opportunities for getting information on the subject have been many, and I state most positively, after comparing the results of hundreds of tests, I have invariably found the cheese cured at 60 degrees and under to be better in flavor and texture than other cheese from the same vat, cured at higher temperatures. But I do not ask you to take my unsupported word for it. I refer you to the pages of my annual reports for opinions of cheese merchants in Great Britain; ask any honest buyer in this country; ask Mr. Publow, the chief instructor; ask any of the instructors whose territory includes cheese factories with cool curing rooms; ask the representatives of any of these factories, and be guided by what they say. I shall be glad to send anyone a list of all the cheese factories in Ontario which are equipped with cool curing rooms. Here is what some of them say.

Mr. J. A. Holgate, patron and salesman of the Foxboro factory, in a letter recently received from him, makes the following statement: "I have tried to make a careful estimate of the matter and I am convinced that in the last two years, during which we have had a cool curing room, we have had at least $600 a year profit from cool curing, on an output of 200,000 pounds

of cheese, besides the satisfaction of having an article of cheese that all the buyers want. Our factory cost us about $600 more with the cool curing room than it would have cost without the ice chamber." That is to say, they were repaid for the outlay in one year.

Mr. G. A. Gillespie, of the Central Smith factory, writes: "It is quite safe to say that they (the patrons) have realized $900 in three seasons from an outlay of about $400.

Mr. J. R. Anderson, a patron of the Mountain View factory, says, "I can honestly say that we are pleased with the cool curing of cheese here."

Mr. T. E. Whattam, Dairy Instructor in Prince Edward County, writes: "In talking with the factorymen who have cool curing rooms, I find them well pleased with the results they have had, and confident that there are better things in store in the future when the benefits of cool curing are better known by the trade as a whole. I wish to say there is no comparison in the quality of cheese cured in the ordinary way and those cured in the cool rooms. I believe cool curing has helped the industry in this district more than any other advanced step in dairying in late years."

I could cite any number of similar statements. The gains mentioned are made up partly by saving of shrinkage and partly by increased price as compared with what would have been received for the same cheese had they been ordinary cured.

I am well aware that cool-cured cheese do not yet receive the premium that they should over ordinary-cured, but I would like to point out that the value of cool curing is not to be measured wholly by the relative price at which the cheese sell. There are many advantages besides an advanced price for the cheese, all of which put extra money into the pockets of the milk producers. In the first place there is a saving of shrinkage, which is very considerable, amounting to about one per cent. In many cases there is a saving of cuts, because there are many cheese which pass without question when cool-cured, that would have developed undesirable flavours and other objectionable qualities if cured at ordinary temperatures. The patrons of factories with cool curing rooms receive more money for their milk than they would do if the cheese were ordinary-cured.

Then I would remind the dairymen of Eastern Ontario that every pound of cheese they have sold during the past season brought a higher price, relatively, than it would have done if a certain number of the factories had not provided cool curing rooms and thus raised the general average quality of all the cheese and increased the demand by encouraging consumption. I have not heard that any of the factories where the improvements have not been made have objected to receiving this premium on the price of their cheese.

The cool curing movement has emphasized the importance of cool transit and has attracted attention to that end of the business. The result is that all Canadian summer cheese are now landed in Great Britain in cooler condition and milder in flavor than they formerly were, a circumstance which has materially helped to give tone to the market.

Now it must be admitted that the Belleville and Picton districts differ from the Brockville section in this respect, that the factories there are mostly owned by the farmers themselves, while in the Brockville and Eastern district they are more largely proprietary. This is probably the reason why the Central Ontario factories as well as those in Western Ontario have been quicker to take hold of this question. But it is not a sufficient reason, for if it has paid the patrons of the co-operative factories, as shareholders in the

companies, to incur the necessary expense, will it not pay the patrons of proprietary factories, who will derive all the benefit, to contribute in some manner to the cost of securing the improvements?

The owners of factories can hardly be expected to meet the whole expense out of the low rate for manufacturing which now prevails, in view of the fact that they will not receive any direct benefit from it.

Now, are the dairymen of the Brockville district going to repeat what they did some years ago when they wrested the supremacy from the old Belleville district, or are these two eastern sections to go on losing probably a quarter of a million a year through failure to take advantage of modern improvements, and at the same time endanger the future of a trade which is of so much importance to them? New Zealand is every year becoming more of a factor in the cheese trade, having doubled her output in two years. Now, note this point: the cheese from that country are all practically cool-cured, because the weather is never as hot there as it is here. This is a new kind of competition and it presents some features which should cause Canadians interested in the cheese industry to do some thinking. Bear in mind that New Zealand cheese arrive in Great Britain during the winter and spring months, or the period of non-production in Canada. If we continue to send cheese of indifferent quality, with heated flavours, etc., merchants in the Old Country will be disinclined to stock up with them for winter trade, but will wait and get a supply of the New Zealand cool-cured, and thus encourage the production of more and more cheese in that country. New Zealand is not a large country, but it is large enough to produce an enormous quantity of dairy produce if there is sufficient encouragement. The output of cheese in New Zealand this year will be, roughly speaking, 400,000 boxes, quite enough to have a material influence as well as a sentimental effect on market conditions. I do not think the alarm which is felt in some quarters over New Zealand competition will be justified if those engaged in the cheese industry in this country make the most of their opportunities. Our safeguard is to make a superior article so as to get a firm position in the market, but to do so we must adopt every reasonable means to that end. We should surely avail ourselves of a plan which ensures immediate returns for the outlay as well as security for the future.

Incidentally I would remind the members of the convention that I am prepared to send plans and specifications for cool curing rooms, free of cost, to any one who applies for them. We will give every assistance in our power towards the building of new factories or in remodelling old ones.

There is another question, somewhat related to the cool curing of cheese, on which I have received enquiries during the past year and which may be of some interest to this meeting. I refer to the proposal to erect central warehouses at points in Eastern Ontario where the cheese could be collected for the purpose of inspection and sale. It has not been made at all clear whether such proposed warehouses, are intended to be cool cheese curing rooms, or cold storage warehouses.

Most probably the proposers have not been very clear on the point themselves. The distinction is a necessary one, however, because the two things are entirely different.

One thing is certain, and it is this: the benefits of cool curing cannot be secured with a central warehouse unless the cheese are delivered there every day, and that means extra expense, as against the usual plan of delivering to the shipping point once a week, or when a sale is made.

Another point to note is that the Government cold storage subsidy cannot be secured unless the warehouse is equipped with mechanical refrigera-

tion, and it would be very poor business policy to incur the expense necessary to so equip a cheese storehouse in a locality where ice is available and when the required temperature is not below 50 degrees.

There may be certain localities where the cntral curing room idea, or a warehouse through which the cheese could pass for inspection and sale, would work out to advantage, but on the whole, the suggestion does not appeal to me as a very practical one.

It is a very convenient way to sell the cheese. We found it so when the Government cool curing rooms were in operation, but the advantages are not worth the additional cost which is thus incurred in the marketing of the cheese, all of which must come out of the milk producer, and which will be greater than appears to be generally supposed.

It has been said that the cheese would be sold on their merits under such a plan and that there will be proper discrimination in price according to quality. It is a very regrettable feature of the cheese trade as well as of other trades, that the producer of a superior article does not always receive the premium which he should. It is generally admitted that nothing would so quickly bring about improvement in the quality of cheese as to have them sold strictly on their merits, but I fail to see why it should be assumed that this reform would be brought about through the medium of local warehouses. The same forces which now impel the buyer to pay a uniform price, and which influence the salesman to demand it, would be at work under those conditions just as they are under any other.

It seems to have escaped the attention of some people that the principal reason why cheese are bought without proper discrimination in quality is because the salesmen demand a uniform price. If John Jones sells his cheese for 12 cents, all the other factories in the neighborhood insist on geting 12 cents also, regardless of quality. Every person knows that that is what happens at the cheese boards. It is what would happen in a warehouse if the cheese were being sold under the trier, because just as soon as a salesman found that he was not being paid the ruling price for his cheese he would withdraw and offer them through some other channel; so the buyer does business along the line of least resistance.

I have for some years thought that the best plan for selling Eastern Ontario and Quebec cheese would be to have a central receiving warehouse at Montreal, where the cheese could be officially graded and then sold by auction, without any recourse. That is to say, the price bid at the auction would be final. The official grading would relieve the buyer of the onus of discrimination, which appears to be the chief difficulty at present. This plan would not involve extra handling or expense, because the cheese would be going through the most direct channel. But there are many obstacles of a commercial nature in the way of giving effect to such a plan, and the disinclination on the part of the average salesman to accept a verdict which puts his cheese out of first grade, no matter how independent or reliable the official may be who passes judgment on them, would be a difficulty in the way of successful operation.

There has been some discussion in Eastern Ontario recently about methods of selling cheese, and the question has been magnified to an extent out of all proportion to its importance compared with other matters affecting the industry. The result of this agitation, as far as it can be said to have had any result, has been to divert the attention of some dairymen from questions of much more real importance to them. The manner in which the agitation has been conducted has been harmful by creating ill feeling between different classes or interests connected with the trade. If there are

any wrong practices, and I shall not deny that there have been, they will not be put right by wholesale charges of dishonesty or mean insinuations and abuse of those who may offer contrary opinions. Abuse is not argument, and is always the resort of a man who has a weak case. I know the men who are included in the different divisions of the cheese trade, from patron to buyer, as well as any person, and I am bound to say that I have found one just as honest as the other. It will do no good to create unwarranted suspicion in the minds of those who have to deal with each other.

In regard to the selling of cheese, I would repeat again that there is only one thing of real importance, and that is, to have an article of superior quality. All other considerations are insignificant in comparison. The factories which have earned a good reputation by turning out a superior article year after year never have any trouble. The competition for their cheese enables them to pick and choose as to whom they shall sell them. Of course, ordinary business prudence demands that some care shall be exercised in dealing only with houses in good financial standing.

It is important also that the business of selling the cheese should be put in the hands of competent men. There are a great many men acting as salesmen for cheese factories who have no special knowledge to qualify them for such a duty; men who do not know anything about the qualities of cheese or of proper business methods, and it is not surprising that they sometimes get the worst of the bargain. Salesmen of this kind are a positive barrier to progress, and they have cost the patrons of cheese factories of this Province a great deal of money, both directly and indirectly. When such a man offers inferior cheese for sale, he will not be convinced of the fact like a man who really knows something about cheese. He assumes that he is being imposed upon instead of finding out the cause of the defects and having it removed. Thus the evil is perpetuated and the losses go on. If the matter is in the hands of a capable man, he will find out where the trouble is and seek to have it remedied.

I believe the middleman is a necessary factor in the successful handling of the Canadian dairy produce trade. In the marketing of cheese, its distribution to the different centres in Great Britain calls for special knowledge, because these different places demand cheese of widely different character. It is a well known fact that cheese which will give satisfaction in the Manchester market are not wanted in London. The same may be said of Glasgow, Liverpool and other points, all of which have their peculiar fancies. It is here, in dealing with these special requirements, that the training and experience of the middleman is useful in realizing full value for different kinds of cheese.

Then there is another very important consideration. Canadian cheese amounts to between 70 and 80 per cent. of the total imported into Great Britain. The consumption of cheese goes on throughout the year, but the manufacture in Canada, as every one knows, does not extend over a period of more than about seven months. The result is that as the season advances the surplus of supply over demand gradually increases. The middleman speculates with this and holds it until such time as it may be required for consumption. It must be very plain to anyone that if all our cheese were forced on to the English market, as it would be on a consignment basis, as soon as it is made, the market would be demoralized before the end of the season. It is safe to say that if every box of cheese made in Canada this year had been consigned to Great Britain within three or four weeks after it was made, cheese would now be selling for a very much lower price than it is. Without the middleman or exporter we would lose the advantage of

the competition for the cheese, which often raises the price higher here than it is in England.

Now, Mr. President, there are many other things which I might discuss, but this paper is already long enough. I cannot close, however, without mentioning one feature of the dairy situation in Eastern Ontario, concerning which there is good reason for congratulation. I refer to the work of dairy instruction. The dairy associations of Ontario are entitled to the credit of having inaugurated a scheme for dairy improvement, when they first employed instructors to visit the factories, which has since been adopted in some measure by every important dairying country in the world. It was exactly 30 years ago this coming season that the Western Association employed the late Prof. L. B. Arnold, of the State of New York, to introduce his new method of cheesemaking, which was known as the "sweet" curd system to distinguish it from the so-called "acid" system then in vogue. Mr. J. B. Harris, of Antwerp, N.Y., was engaged by your Association in 1881, and two following seasons, to visit the factories in Eastern Ontario. After that, Canadian instructors were employed, and it should be a matter of pride to us all that it has never since been thought necessary to go outside of the Province for dairy teachers; and what is even more complimentary, the United States, New Zealand, Australian and Scottish authorities have induced many of our best men to accept service in those countries. The dairy instructors never had a fair chance until they were made independent of the factories, as they are at present. The value of the instructors' work has been increased enormously by the aggressiveness and fearlessness engendered of freedom. It is gratifying to find these men taking their place as leaders in their respective localities. The successful instructor must possess other qualities in addition to technical skill of a high order. He must be tactful, patient and persistent, as well as industrious. A blustering, grouching, faultfinding manner destroys the effectiveness of any man's skill in this kind of work, because the Canadian temperament calls for a leader, not a driver.

It has always appeared to me that there should be a little more organization in connection with the different districts, but as long as the matter is under the energetic and capable supervision of Mr. Publow we have an assurance that the work will be well done. As a last word, let me say that this scheme of dairy instruction should have the hearty support of every Ontario dairyman, for it has put millions of money into the pockets of the milk producers.

The CHAIRMAN: The last few years at the meetings of our Associations we have been honored by having with us representatives of the Produce Association in Montreal. We have always been very glad to have them with us. We have had an opportunity of seeing the men we are doing business with, and we have been able to talk to them and ask questions as to what becomes of our goods. To-day we have with us one of the veteran buyers at Montreal, whose name is a household word to every dairyman in the Province of Ontario. I refer to Mr. A. A. Ayer. (Applause.)

ADDRESS.

By A. A. AYER, MONTREAL, QUE.

I am very pleased as President of the Montreal Produce Association to be here with you this afternoon, and to extend our congratulations and best wishes to your Association, and more especially in view of the fact that it

is now well-known that Eastern Ontario is the most important cheese making section of all Canada.

I regret that I had not the pleasure of listening to your President's address, and the facts that he set before you, but I had it placed in my hands since, and I congratulate him upon the way in which he presented the conditions of the trade to you.

Professor Ruddick has entered into a great deal of detail on some things that I propose speaking to you about, therefore I will only need to refer to them.

I suppose it is the tendency of most successful men to be optimistic, and they have a sort of way with them of not referring to the things that are not pleasant. They look upon things from an optimistic side, and they can hardly bring themselves to see that the cheese industry during the past year has not been a prosperous one. Nevertheless, we might as well face the fact and say it is not as prosperous to the farmers and merchants as it has been in many years. It is good for us now and again to have these little set-backs. It teaches us, and it reaches our pocket like nothing else can do. This is not a time to boast of the net results of the past season, but it is a time in which we might look at the plain facts—that we might face the difficulties that are before us and try to overcome them.

Let me say at the outset that I think a great deal of time and attention has been given by the farmers of this country to the marketing of cheese, and my opinion is that the system of marketing cheese in Canada for all practical purposes is as nearly perfect as possible. I do not say improvement cannot be made here and there, but the general system is more perfect than that of any other country in the world. A great deal of time has been spent by the salesmen and farmers interested in the manufacturing of cheese in trying to squeeze out the last one-eighth of one-sixteenth or one-thirty-secondth out of their cheese, and they have devoted a lot of time in this direction that might be devoted in other directions. The market will take care of itself, and competition will bring about results.

I am surprised that so much attention has been given by newspaper men and others to this question. If they would devote their attention to other ways in which the farmers could make more money it would be better for all concerned, because after all we are in the cheese business for the amount of money we can make out of it, whether it be the farmer or merchant.

It seems from the experience of the last season or two that high prices do not always mean prosperity. I heard a business man in Montreal say, "You are having a fine cheese year; the farmers must be prospering." But he did not know the conditions. Take this year as compared with last year, and last year as compared with the year before. Every farmer knows what the net result of the season has been. You had high prices, but you had poor pastures, and lack of feed, and the high prices have not brought you in the same money per cow as you obtained the previous year; and you have been obliged to buy a large amount of feed. The farmers are becoming slaves to the mill-owner, and are buying too much mill feed which they ought to be raising on your own farms. (Applause.)

In 1903 the total make of cheese in Canada was just past the three million boxes, in 1906 it was about two million and a half boxes, and this present year it will be only slightly over two million boxes. There is something wrong somewhere. What is it? Perhaps you do not know. I do. We have been spending a great deal of time for a great many years—one speaker says twenty-six years—I might say 40—in teaching the makers how to make

cheese, and we have been learning some of the lessons over again and finding out other and better methods.

We cannot work out any problem and know it all at once, and some things that we think are facts we afterwards find are not facts at all. We have vastly improved in the manufacture of cheese in this country. The Dominion Government and the Government of the various Provinces have been assisting in the manufacture of cheese, and to my mind the majority of men who are engaged in the manufacture of cheese to-day can make a first-class article if you give them first-class milk to make it of. How is it we were making three million boxes a few years ago and only making two million now? How far have you gone during these years in selecting your cows? Let me ask you a plain question: Have you stopped using poor cows?

I would like to see a plan adopted that they are carrying out in Saskatchewan. Why are we sending on milk to all kinds of factories? Montreal and Toronto will not allow milk to come there for consumption without being inspected. They will not allow milk to be delivered in all kinds of cans and receptacles. It has to be handled in a proper and scientific way. How can you expect to get the best quality of cheese out of a small and unsanitary factory? Almost the total quantity of rejected cheese came from the small unsanitary factories, and until you can improve that matter, especially in the eastern part of Ontario and Quebec, you cannot hope to get that first-class article which Mr. Ruddick has been speaking about. The small factories, if carried far enough, will spell ruin to the cheese trade. If we are to hold our own with New Zealand—which by the way is sending near 5,000 boxes—we must have some style to our cheese, we must not use these old heads and have rough edges. We must have them sharp and fine, and we must have the cheese put in proper boxes and we must have the weights stencilled on. There is a very serious matter coming up just now, and that is the loss in weight. It follows with green cheese that is shipped and the large amounts of moisture. In New Zealand they allow two and a half pounds per box of 84 pounds, and the result is that New Zealand cheese will not only stand weight, but it arrives in England and will stand weight for some time after. Our cheese are loosing two and three pounds per box. There must be a greater allowance for weight, or you must hold your cheese a longer time or take less price. We must not only produce more cheese, but we must produce a finer article, and it must keep its weight. A man who is making first-class cheese should not be afraid to put the dates on his cheese, and when that is done that man who is not making equally as good cheese as yours will be obliged to put his date on, and the date will have a great deal to do with the price.

Mr. RUDDICK: Would you put dates on the cheese?

Mr. AYER: No; I never yet received an order for 500 boxes of July cheese; but if we knew the date they were made we would know how long you have kept them in your factory. We have objected to the Saturday Boards, because it creates a lot of inconvenience and the cheese have to be held over for another week. I do not see why every factory in the country should not adopt the plan of numbering their vats; it would save a great deal of trouble if they would do so.

I want to commend cool curing as spoken of by Mr. Ruddick to-day. The people of France and Spain were not aware of the reason why wines produced in the mountains were so much better than those produced in other parts of the world. The fact of the matter was that the wines were kept in cool caves in the country which were virtually cool-curing rooms; and we are only now adopting the same thing in the curing of cheese. Cheese are

held in the cold storage in Montreal, and sold when the market is best; and if they were sold as fast as they were manufactured and placed on the market each season when there was not any great demand the price would decline because you would cause a glut in the market. We are working in the interest of the farmers in the country. What profits you profit us, and what profits us profits the farmers of Canada.

Mr. J. H. Singleton: With your permission I would like to present a resolution before the meeting at the present juncture. I want to move, seconded by Mr. E. Kidd, that "Whereas it is evident from the experiments conducted by the Department of Agriculture of the Dominion of Canada as to the best methods of caring for and preserving milk by dairymen for cheese making purposes, as presented by Mr. Barr, a member of the Dairy Department, at the Eastern Dairymen's Association of Ontario (assembled this 7th day of January, 1909), to be for the greatest importance and value for the improvement of the quality and quantity of yield of cheese from milk;

"And whereas it is considered to be in the best interests of the public, and milk producers, that such experiments should be at once publicly circulated to as wide an extent as possible;

"Be it therefore resolved that the Dairy Commissioner, Mr. J. A. Ruddick, be requested to publish in bulletin form and the public press at as early a date as possible the practical results of such aforesaid experiments."

This resolution requires no further explanation. Mr. Ruddick has told us of the importance of cool-curing cheese, and while we do not want to throw any cold water on that, there is no question more important for the dairymen of the country than this cool-curing of the milk; and we have had such an extreme proposition come to us in such an excellent manner this morning by Mr. Barr, that I am sure you will all agree with me that it ought to get the widest circulation. The motion was carried.

ADDRESS.

By G. A. Putman, Director of Dairy Schools, Toronto.

You will be glad to know that during the past season the work has been the most satisfactory of any yet, and the experience throughout the West is the same as the East. The sanitary condition of the factories have been improved from year to year, and this year the factories, the owners of factories and the makers and producers have all taken a common interest and pride in improving the sanitary conditions of the factories. The factories in the West are larger and many of them are pasteurizing the whey, and we hope to see that feature of the work extended. The makers in the West are better qualified than those in the East, because the factories are larger, and they are able to pay more money. I believe the quality of the milk delivered in the factories of Western Ontario is better than that in the East, and one of the reasons for that is that we have appealed to the women on the farms to take an interest in this feature of the work. We have been able to interest the women through our Women's Institutes, and by sending out lecturers to address them on the care of the milk. The women have seen to it that the men do the work properly. We trust you will have more Women's Institutes in Eastern Ontario. We have a great many more inquiries with regard to this than ever before, and we believe next summer we will have organizations established.

We made a census in Western Ontario, and we find that the average test was only 3.5 per cent. butter fat. I have received reports as to the manufacture of whey better. The factory at Kerwood manufactures cheese and butter, and they were able to make butter from the whey and from the cream taken direct from the milk, and they had an opportunity of comparing the quality of the butter made from the whey and from the milk. It was found that the average quality of the butter made from the whey as compared with that made from the cream separated in the same factory was always lower than when it was freshly made, but when it was kept in cold storage the quality of the butter taken from the whey is not first-class. When it is kept any length of time it deteriorates in value and quality. It will not pay to equip your factory for the purpose of making this butter unless you are getting a very large quantity of milk. It would not pay a company to install the necessary machinery, and it is a very dangerous practice. It puts a premium on carelessness on the part of the maker, and that is the most serious point in connection with this whole question.

Mr. Publow, Mr. Dargavel, and myself have talked over the matter of certificates for makers, and during the past few seasons Mr. Publow has taken a census of the makers in Eastern Ontario, and we have also had one taken for Western Ontario. It is not the intention of the Department or the Association to give out the information to the public, but is valuable information for the Inspectors. In Ontario we seem afraid of legislation. We are set in our ways. It seems easier to put legislation into effect in the new Provinces, and it is quite likely that the Legislature will not pass any legislation unless the men directly concerned in the industry make some appeal to the Government. When the suggestion was made that we should have sanitary inspection of factories and farms some of the farmers were very strong in their appeals to the Department that such legislation should not be enforced. They said they were free citizens and were not going to be compelled to do this or that; but now I do not think you will find any farmers who will say a mistake was made when we introduced that legislation.

We have been successful in getting practical men who enforce the legislation, and I am sure that if legislation were introduced regarding qualifications for makers they would be pleased with it. I do not think we could say that every maker in 1910 should have Dairy School qualification, but some scheme ought to be in force whereby permits could be given and men who have been successful should not be barred out.

I am sure that a more effective system could be inaugurated, and I trust this Association will make some appeal to the authorities that be that such legislation be introduced. I believe some legislation should be inaugurated, that a factory could not be started within a certain radius of another factory without first securing a special permit from the department.

A MEMBER: Would not that be creating a combine?

Mr. PUTMAN: I do not think it would be a combine. I think it would map the work out in the best interests of the industry. I was approached yesterday by a representative from Prince Edward County. He said they had expended between six and seven hundred dollars in putting in cold-curing plants, and the farmers a few miles from them are now thinking of putting up a small factory in the hope that they will be able to have their cheese manufactured for a little less. They certainly will kill cold-curing rooms. One of the large factories is hesitating as to whether they will put in ice in view of the fact that some of the farmers are thinking of putting

up an opposition factory, and it seems to me we will never make progress until that matter is regulated in some way.

When you take a large territory and the number of patrons, the number of prosecutions for watering the milk is very very small, and we in the Department are very gratified to know that the suggestions which we made a year ago last spring has worked out so satisfactorily and has not been a bill of expense to the Department or the Association.

CREAMERY INSTRUCTION AND INSPECTION.

By James Stonehouse, Dairy School, Kingston.

The creamery season for 1908 in Eastern Ontario has been satisfactory in some parts and unsatisfactory in other parts. The unsatisfactory conditions existed in the most easterly part and along the Ottawa River and were caused by a lack of pasture, the season being extremely dry from the 1st of June. Between Belleville and Toronto the pastures were up to the average through June and July and prices were very satisfactory for butter all through the season from the producer's standpoint and undoubtedly unsatisfactory from the consumer's standpoint, as prices have been unusually high nearly all through the year. A great deal more butter found its way to the British market this year than was sent over last year, which tended to stiffen prices for creamery butter. The bulk of the creamery butter made in Eastern Ontario is put into prints and is consumed largely in the district bounded by Montreal and Toronto. Nearly all the creameries in my district are located at easy shipping points, which is conducive to doing a print trade.

I had only one creamery in my district (Maxville) which was exclusively a whole-milk creamery; I had two others, Locust Hill and Peterboro, which separated a portion of the milk at the creamery.

The make of butter throughout my territory was fairly uniform, only one creamery pasteurizing the cream throughout the summer, and the benefits of so doing were very apparent in the finished product. This creamery takes no sour cream and pasteurizes all cream and milk taken in. The custom of collecting cream only twice per week is becoming almost general and from the standpoint of quality this is to be regretted. The cost of hauling has increased so much during the past four or five years that collecting three times per week eats up a great part of the profits where the creamery patronage is small or where the patronage is falling off, as it is in many cases.

Some of the older creameries have suffered a great shrinkage in their output during the last three or four years and they are curtailing their expenses in every direction as much as possible. One cause of the shrinkage is lack of cows. Many cows were sold off during the fall of 1907, and a great many were farrow during the past season. Lack of farm help is another cause and the strong demand for dairy butter is another.

I have found the individual cans giving excellent satisfaction where they have been successfully introduced. The cream seems to come to the creamery in better condition and the maker has a better chance to examine it for quality. The principal objections to the individual can are the extra cost of cans, either to the patron or creamery, and the limited district which can be covered unless they are shipped.

Tanks are used in only two creameries in my district, and they also have their advantages and disadvantages. For long hauls over rough and hilly country they seem to have an advantage, and much more cream can be hauled

on a given number of square feet of waggon bottom than in any other way. Jacketed cans are the most popular among creamery men, as they have several advantages over the other methods. I found a great lack of proper covering for the cans while on the road. I induced one creamery to adopt a canvas covering and the buttermaker reported that the cream from the covered cans came in 4 degrees cooler than those not covered. These covers not only keep the temperature down but they prevent the dust and mud from getting into the cans. This road dust is one of the worst things that can get into milk or cream as it is always laden with germs of a putrefactive kind.

There is a lack of cold storage facilities for keeping butter at a low temperature. I have 28 creameries in my territory and none of them use the salt and ice system. The large majority ship out their product once or twice per week and some ship every day, thus lessening the necessity of low temperatures. Low temperatures, however, are a necessity where the butter is for export. The majority of creameries in Eastern Ontario are particularly well situated to cater to the large consuming centres and they are not paying much attention to the export trade, and for that reason they do not attempt to provide first-class cold storage. There are but few unsatisfactory buildings used as creameries in my district and only four which have not cement floors in their make room, and many have cement all through.

I found a general uniformity in the amount of moisture contained in the butter, usually running from 12 to 14 per cent., but individual cases running from 16 to 20 per cent. Where an attempt was made to incorporate moisture, I usually found the highest test.

The score of the butter for quality was generally not as high as is desirable, and this is accounted for by the cream generally not being kept at a temperature sufficiently low to prevent it from becoming too sour and the cream not being gathered often enough, usually twice per week. The cream is generally handled in good shape after it is received at the creamery, but the buttermaker usually has but little control of his product as the quality is fixed in the cream before he receives it.

I have found that where the cream is made rich and kept at a low temperature at the farm, that it is usually in first-class condition when it leaves the farm. Many patrons of creameries insist upon sending the low testing cream, and I find that the creameries getting a low testing cream usually turn out the poorest quality of butter. The reason for this is that a low testing cream has too much milk left in the cream, and it is the constituents of the milk which sour and decompose and cause bad flavors. A rich cream has less of those decomposing materials in it, and the less we have the less chance there is of bad flavors developing in the cream. It would be a good thing if all cream haulers could be paid according to the amount of fat they bring in, as this would induce the haulers to insist on rich cream from the patrons. Where this is in vogue it works well, as it makes the haulers hustle after cream and they won't carry any more milk than they are compelled to.

In summing up the suggestions I would make for the improvement of the creamery, the first and most important is a richer cream kept at a lower temperature while in the hands of the patron; second, gathered as often as necessary to insure against old flavors; third, pasteurizing to eliminate food and other injurious flavors; fourth, have canvas covers for all waggons that carry cream in cans; fifth, wash farm separators after each milking. Neglecting to wash separators after using is becoming a very common practice and cannot be too strongly condemned. People who consider themselves very clean in other respects are falling into this error along with the most careless.

ADDRESS.

By A. A. Ayer, Montreal, Que.

Mr. Ayer was presented with a beautiful bouquet as he rose to address the audience. His address is as follows: I feel at home when I am among my own class, the farmers, but I confess I feel nervous among so many handsome ladies this evening. I spent my time till I was 21 years of age on the farm, and two of my sons are farmers, and my father and grandfather and great-grandfather were farmers. I would like to have this audience, and especially the young people in it, realize the pleasure there is in doing things. One of the greatest wonders to my mind in the universe is the growth of the grasses and the grains. I wonder how many of you realize that one of the greatest things you can do in this world is to make two blades of grass grow where only one grew before. Do you also realize that the business in which I am engaged has no increase in values. The article does not increase in value because I happen to be the owner of it, and there is no real pleasure in it; but there is pleasure in a business where the article you handle increases in value. Therefore do you wonder that my love goes back to the farm life again, and that I get more joy out of the old homestead than I do in the trading business in Montreal. I wonder how it is that on some farms the buildings and surroundings are clean and well kept and handsome while in others there is the very reverse. The real secret to my mind is the man and the woman. They do not love work; and I am sorry for the man or woman or the boy or girl who has not learned the real genuine love for work. One of the greatest things of beauty in this world are the grain fields—they spell plenty. I am glad that the ladies in these days have taken to wearing green things. They have adorned their dresses with green; and if you look at the trees and the grass when growing and count the shades of green it will give you a lot of pleasure. In the spring when the grass and other things are coming up count how many shades of green you can find, and you will be surprised at the number, and then you will begin to realize the beauty there is in country life,—in the green pastures that produce the food that is so necessary. If we farmers go about our business in a right way, cultivate our farms in the right manner possible, we can make money. The majority of farmers try to farm on too large a scale. They want to plow up 10 acres when they should only plow up 5. We have failed to fertilize the land sufficiently; we have failed to rotate our crops as we should do, and so increase the value of the farm and its productive capacity. We have failed to select the seed. The selecting of seed is one of the greatest factors for success in farm life. We should build silos in which to keep our corn. In the dry seasons, we should have plenty of feed on hand so that our cattle shall not want for plenty of good succulent food.

We have had cheese instructors in Ontario for many years, and we have become almost perfect in cheese making. The Government has spent thousands of dollars, and the farmers have assisted, until cheese making has become one of our chief industries. Why should we not have farm instructors as well? The farmer is behind the factory and why should not each individual farmer have an opportunity of getting instruction? I am afraid we have been just a little above instruction, and some of us think we know a little bit more than our neighbors about these things. I know two farms that are situated side by side, of equal natural value, and on one of which there was more raised in 1906 than in 1905, and more in 1907 than in 1906, and still more in 1908, notwithstanding the dry season, than in 1907, while the neighboring farm

has been the very reverse. The man on the neighboring farm thought he knew it all, while the man on the other farm was teachable, and he is progressing.

I would like to see in each county in Ontario a model cheese factory, and, if possible, a model butter factory; and surrounding these I would like to see model farms. I would bonus that factory with a large amount of money, in order that the neighbors and others in the county might see what could be done in farming, and in making farms beautiful and attractive, and would make it attractive to the young—so attractive that the handsome young ladies in this audience would seek to find farmers' sons for their husbands rather than city men. (Applause). I want to say to the young ladies present, give me a farmer's life. I think I said this afternoon that we were in this business for the money that is in it; but I think I ought to partially correct that and say that we are not in the business solely to make money, but we might make a change and increase our production in this country and still make money. I said this afternoon there was less cheese made this year than last year, and last year than the year before, and the high price of cheese had opened the door for the New Zealanders and the Dutch and even for the Italians to come and take our customers away from us. Now, we do not want that to be, and the only way to prevent it is to increase the quantity of our product, and in order to do that we must increase the product of our farms.

The wisest Teacher that ever lived gave these words to his disciples: "Go preach, teach"—personal responsibility to them—and that is the word I give to the delegates here this evening. When you go back to your homes, realize that you have some responsibility to your neighbors. Preach to them, and teach them the better way of conducting their farming operations, and lay out your own plans in order that you may do effective work in the coming season. That same Teacher gave as the greatest of all the commandments: "Love thy neighbour as thyself." I am afraid we are living a selfish life, and living for self and forgetting all about our neighbors. Would it not be a grand thing for us to go forth from this Convention with a definite plan? Why cannot this Convention be better than all previous Conventions by having a definite plan to carry out by which all the farmers of this country will become enthusiastic over doing better work for making their homes more beautiful than they have ever been before—attractive to our young people, so as to reverse the order of things and attract the young people from the cities to the country, instead of from the country to the city. That ought to be the order of things, because back to the simple life is back to the joyous life, back to the healthy life, back to the working life, back to the life where we get nearer to God and nearer to nature than we can possibly do in the great cities. (Applause). Every butter and cheesemaker in this Province ought to be a centre from which should radiate instruction to the patrons of the factory; they ought to create an enthusiasm among their patrons to do better and more effective work.

At this juncture the Mayor of Prescott was presented with a handsome bouquet by a young lady, on behalf of the Association, to which he made a very suitable reply.

THE CHAIRMAN: I have now much pleasure in calling on a gentleman whom I am sure is no stranger to this audience, Mr. Howard Ferguson, the member for Grenville. I have been perhaps unfortunate enough to have a seat in the Ontario Legislature for the last four years, and, representing the Dairymen's Association, they have looked to me to champion their cause. During my term in office I have had no more devoted ally in the House than Mr. Howard Ferguson. It might seem strange that in a House where

there are a number of farmers that I should have to look to a lawyer for assistance in this work; but I can assure you that when the farmers get into Parliament most of them get lazy, and do not have that interest they should have in the claims of their constituencies. I have heard the remark made in rural constituencies that they should elect a farmer. That is all very well; but, somehow or other, it is my experience that it does not work out as some people think it should . We have citizens who have been brought up in rural communities who thoroughly understand the wants of rural constituencies, just as much as many men who happen to live on a farm. I would rather see more people of this country living on farms, but I do not think that gives them any more interest in the wants and welfare of the farmer than a bright, sharp man who has been brought up in the country. If I want anything for the Dairy Association, all I have to do is call on Mr. Howard Ferguson to assist me and he will go at it often times much better than I could myself. I have therefore much pleasure in calling upon Mr. Ferguson to address you.

ADDRESS.

By G. Howard Ferguson, M.P.P., Kemptville.

I came here to-night, not for the purpose of making an address, but to show my interest in the grand work that is being carried on by the Eastern Dairymen's Association in connection with the farming industry, and particularly to congratulate the Dairymen's Association and you upon the magnificient gathering that was held here yesterday and to-day. Unfortunately, I was unable to be here yesterday, but I am told you had a splendid meeting. When the President of the Association first intimated to me that it was suggested they should come to Prescott for their meetings, I assured them they would receive a hearty welcome here, and I am glad you have put forth special interest on behalf of the largest and most important industry in this country. I know that Prescott appreciates a good entertainment, because I have spoken here myself at several lively entertainments. (Laughter.)

I claim to be somewhat of a farmer. I have ten acres of land, and I know that over five acres is always taxed as farm land. At any rate I am interested in anything that interests the farmer. Three-quarters of the people of this Province are engaged in the farming industry, the other one-quarter are only parasites living on these farmers; and it behooves them to see that they get along, because we have to live off these fellows, and for that reason so long as I have to farm the farmers I want to see the farmers succeed. Three-quarters of the people in this Province are directly interested in the farming industry, and the other quarter are just as much interested. There is no business under the sun that will show such grand results from intelligent application as will the farming industry. I venture to say there is not a man in this hall but can put his finger on a farmer who is almost starving, and his family practically in want, and he is on a good farm, while his neighbor with intelligence has succeeded in paying for a very poor farm and making a success. The first feature to look at is to find out for what your soil and locality is adapted. The natural conditions seem to show that in this Eastern part of the Province the industry that will give the best results is dairying. You were told this afternoon

by Mr. Ruddick that three-quarters of the dairy product of Canada comes from Ontario, and almost three-quarters of that comes from the Eastern part of Ontario. I think he told you that some 80 per cent. of the dairy product of Great Britain came from Canada. What does that means? It means that we should look at this problem seriously. There are two features to be borne in mind—the farming business is just as much a commercial enterprise as any other business can be, and the farmer should look at it in that way. The central point you should keep in view is the making of money out of the farming industry. There is the quantity of the product and the quality. After paying some attention to the matter, I have come to this conclusion: We have no trouble about quantity of the product. That depends on the classification of the stock, and the way you feed them, but you may over-produce if you have not got the quality, because you cannot get the market. Therefore the important point is the quality, because if you produce the best quality of cheese and butter you will always have a demand for it, and you cannot over-produce if you can compete with the rest of the world successfully. In almost every other branch of food production we are more particular than in the cheese industry. I pass farms day after day where the man has a well in his barnyard, and another at his back door. He won't take a pail of water to make tea from that barnyard well, but he will water his cattle and wash his milk pails with it, and then he expects to take good milk to the factory.

I have always been glad to second the efforts of my good friend, Mr. Dargavel; he has been untiring in his efforts to bring about beneficial legislation in the interests of the farmers.

Complaints have been made about our being burdened with inspectors and instructors. Somebody has said that people should be, in a commercial sense, allowed to do what they liked, and allowed to send milk to any factory and pay what they like for the cheese and that sort of thing; that competition should be allowed to run rampant in this business; but that is not the doctrine to which I subscribe. I think we need protection in this particular branch of food production, perhaps, as much as we do in anything else. They inspect your bake shops and your slaughter houses, and why should not they inspect your cheese factories? Why should you not insist upon having cleanliness and sanitary arrangements on one of the most important products that we manufacture in this country to-day?

Your financial prosperity depends upon the quality of the product more than on the quantity, because, unless you produce the quality you can produce the quantity, but you will not find a market for it.

The CHAIRMAN: I now have much pleasure in calling upon Dr. Robertson, of St. Anne de Bellevue College, Quebec. It would be entirely uncalled for on my part to say anything about Dr. Robertson except perhaps to some of the younger people in the assembly. Dr. Robertson has done more for the dairymen of the Province of Ontario and for the Dominion of Canada than any other man, and he is still carrying on the work. I am sure you will all enjoy his address and we feel very grateful to Dr. Robertson that he has consented to be with us to-night and deliver an address.

ADDRESS.

DR. J. W. ROBERTSON, ST. ANNE DE BELLEVUE COLLEGE, QUE.

DR. ROBERTSON was presented with a handsome bouquet on rising to address the audience, and opened with a few jocular remarks. He then went on to speak of dairy education, and the benefits that resulted from co-operation in the making of cheese and butter, and placed particular emphasis upon the enlargement of vision that came to farmers from meeting together in conventions and other agricultural gatherings. Canadians should rejoice in the fact that they were the freest of men, and were not like the moujiks of Russia. He pleaded for methods of education that would make the land more beautiful and attractive, and thus keep our boys and girls upon our farms. He also advocated manual training in public schools, as it was well to let our boys know from the start that they were expected to be workers. It was thus that human life was to realize its highest conceptions.

RESOLUTIONS.

Moved by T. A. THOMPSON, seconded by R. G. MURPHY, "That, whereas the success and educational value of this Convention is largely due to the presence of the speakers who have so ably addressed our meetings, we desire to express our sincere thanks for their kind assistance and presence throughout the various sessions." Carried.

"That we the members of this Association desire to express our appreciation of the kindness of the Mayor and Council, members of the Board of Trade, and citizens of Prescott in furnishing the use of the Town Hall free of charge to the Convention." Carried.

"That the thanks of the Convention be and they are hereby tendered to the Canadian Salt Company of Windsor, Ontario, through their general Manager, Mr. Henderson, for the very handsome badges presented by the Company to the members of this Association." Carried.

"That we as dairymen feel that we are under great obligations to the Department of Agriculture for the assistance they have rendered the dairy industry of Ontario." Carried.

"That as an Association, we wish to express our satisfaction with the work of the special officers appointed to take charge of the work regarding the adulteration of milk, and we recommend to the Board of Directors for 1909 the continuation of their services." Carried.

"That this Association wishes to express its gratitude to the several railroad companies for their kindness in reducing rates from all points to Prescott, during this Convention." Carried.

Moved by Senator DERBYSHIRE, seconded by C. D. RUDDICK: "That this Association recognizing the great value of the present campaign instituted by the Dominion Government in favor of a large milk yield from better cows, urge upon the Dominion Minister of Agriculture the great need for a rapid extension of the work of the Testing Associations." Carried.

Moved by H. GLENDENNING, seconded by T. A. THOMPSON, "With a view to improving the position of cheese and butter makers, in Ontario,

and also to place the owners and managers of factories and creameries in a position to secure well qualified makers, this Association in convention assembled respectfully request that legislation be enacted, setting forth the qualifications of makers, who may be allowed to take full charge of the manufacture of either cheese or butter. It is recommended that a full census be taken of the makers and helpers, during the season of 1909, and that certificates of efficiency be issued to those who are considered qualified for the season of 1909, and that for the season of 1911 only those who receive certificates be allowed to occupy positions as head makers.

"We beg to recommend that a committee be appointed by the directors of this Association, to co-operate with representatives of the Western Association, in recommending basis upon which permits or certificates be issued." Carried.

REPORT OF NOMINATING COMMITTEE.

The report of the nominating committee was received, and on motion of Mr. H. GLENDENNING, seconded by Mr. Jas. WHITTON, was adopted. The list appears on page 5.

The CHAIRMAN: I believe it is a fact that every one of these names are names that have been nominated at the several district meetings that have been held. There is a little misapprehension on the part of some people who imagine that at these district meetings the directors are elected. They are only recommended to the Association, from the fact that nobody has a vote as to who the directors will be except he is a member of the Association. It would be an absurdity if the people at large had the privilege to elect the members of the Association when they were not members. A man who took considerable pains to get himself elected last year, because he thought there was some pay attached to it, when he found that it was only a labor of love and nothing but the expenses were paid, sent in a letter declining the honor.

SECRETARY'S REPORT.

By R. G. MURPHY, BROCKVILLE.

I have the pleasure, as your Secretary, in presenting my annual report for the year 1908.

I need not enter into the history of the growth of the dairy industry since 1864, when the first cheese factory was situated in Canada, nor since the organization of the first Dairymen's Association in 1867, but it goes without saying that it has proved to be an industry peculiarly adapted to this country, and one which we can boast of as having made remarkable progress. Our cheese still occupies the proud position of being the largest amount sent to the markets of Britain, of all the countries of the world, and has a reputation in these markets that other countries envy. This enviable reputation has been obtained by education through various channels, among which are dairy schools, dairy instructors, sanitary inspectors, the holding of special dairy meetings, the disseminating of dairy literature and the holding of conventions, such as this, all of which have been liberally assisted by the Department of Agriculture of the Ontario Government. The Department at Ottawa was not slow in recognizing the importance of assisting in building up this reputation by giving us better transportation facil-

ities and in other ways. But the various methods we have adopted have been taken up by other countries and some of them are already our competitors. If Canadian dairymen wish to continue to lead they must continue this education. We cannot stand still; we must keep advancing along the lines set forth in the wise and practical counsels given at this Convention. Education is a slow process, but many of the things said here will bear fruit, and no man need apologize for having taken part in the deliberations of this Convention, which, together with the thirty-one others which have preceded it, have done so much for the upbuilding of the dairy business in this country. In view of what has been accomplished by this Association, backed up by the Government, past and present, many men can, without boasting, say "We are proud of what has been done." I know there are a few who are skeptical in regard to the good accomplished by this and kindred Associations, but I believe it is because they misconceive the real functions of this institution. The directors do not claim for it perfection, but they do claim that it has assisted the dairymen of this country, by furnishing them with facts for their instruction, and they have, in turn, adapted them to their particular circumstances, and thus been able to produce a better product. The assistance thus rendered has not come too soon, for there is a demand calling louder and louder for better cheese and butter, and, in order to produce it, we must help the manufacturer to call louder and louder for better milk. Higher grades of dairy products require higher and better grades of milk.

Much good along this line has been accomplished by the holding of about twenty dairy meetings during the months of November and December, which have been exceedingly well attended in most instances. Speakers who are practical men have been sent to these meetings by the Association, and by this means the men who do not attend Conventions like this, men who read little and think less, men who have got into a rut, have been reached, and we are looking for results. It is the careless, indifferent men we have been trying to reach through these special dairy meetings, feeling that others would look after themselves, although constant watchfulness is necessary lest the best of us find ourselves in a similar rut. We must plan and labor, agitate and educate, continue to devise the ways and means by which we may be able to maintain the proud position we now hold in supplying the British market with the largest share of her imported dairy products.

Men, who want to know more about their business, have attended the sessions of this Convention, and if, by having listened to the advice and counsels given by the various speakers, they are able to take home with them a higher ideal than they had before, the seed, which, if sown, will grow into better conditions, then the work of this Association has not been in vain.

It is no idle boast when I say that this Association has done a great deal to encourage the industry and place it in the position it occupies today. It has worked in unison with, and encouraged, in every way, the Dairy School at Kingston, which has done such a noble work in the education of our makers.

The annual reports of our Association have also been the means of disseminating much valuable information in respect to all branches of dairying. I regret that more farmers do not belong to the Association and take advantage of the benefits it offers. A tribute should be paid to the zeal which some of our friends have displayed in encouraging and promoting the dairy industry in this part of the Province. Some of them have been in the forefront of the struggle to attain better things and secure a higher

standard of efficiency in dairy farming, and their aid has been invaluable. But it will require the united and best efforts of our Association, of our Dairy School, of the Inspectors, factorymen, farmers and shippers together with the help of the Departments of Agriculture at Toronto and Ottawa to keep our dairy products in the front ranks.

In my opinion, annual gatherings, like this, of men from different localities, who are engaged in the practical work of the industry, have an educational value, which should be appreciated. Some men, engaged in this business, who keep on their way by themselves regardless of what others are doing, may know a great deal more, and very often a great deal less, than they think they do, but when they hear what other people have done, with the reasons, explanations, and conditions of courses followed, they are in a better position to judge of the soundness of their own ideas. And, even if they are half way intelligent, or progressive men, they can hardly attend one of these meetings without getting their eyes opened to some weakness in their own methods or see some chance for improvement; while, at the same time, they may be able to give information on points that will be new to others. There is no work upon the farm where people vary so much in results as in dairying, hence the need of further education along these lines.

The work of the Association was very ably outlined in the opening address of our President, and I have but little to add.

At the various special dairy meetings held throughout the eastern part of the Province, men were named to represent the various districts upon the Board of Directors for the year 1909. By this means, the board is composed of men, selected by the voice of the people, who attend these meetings. Every farmer, farmer's son, cheese maker, cheese manufacturer, salesman and buyer, who resides in the county where the dairy meeting is held, has a voice in the selection of the man who shall represent them as director upon the board.

The following are the names of the gentlemen, who have been selected by the vote of the people, to compose the board for 1909, and the county or counties they represent.

John H. Singleton, Smith's Falls, Renfrew County.
Neil Fraser, Vankleek Hill, Prescott County.
Edward Kidd, North Gower, Carleton County.
Napoleon Longtin, The Brook, Russell County.
John McGregor, Alexandria, Glengarry County.
P. McDermid, Avonmore, Stormont County.
C. F. Whittaker, North Williamsburg, Dundas County.
James A. Sanderson, Oxford Station, Grenville County.
John R. Dargavel, Elgin, Leeds County.
T. A. Thompson, Almonte, Lanark County.
Joseph McGrath, Mount Chesney, Frontenac County.
W. J. Paul, M.P.P., Tamworth, Lennox and Addington Counties.
James Whitton, Wellman's Corners, Hastings County.
Alexander Hume, Menie, Northumberland County.
G. A. Gillespie, Peterborough, Peterborough County.
A. S. White, Sydney Crossing, Prince Edward and part of Hastings County.
Henry Glendinning, Manilla, Ontario, Durham, Victoria and Haliburton Counties.

In addition to those named there is Hon. Senator Derbyshire, who was made honorary president, and Chief Instructor G. G. Publow, who is named to represent the cheesemakers of eastern Ontario. These are the gentlemen,

who have been named to look after the interests of the dairymen of eastern Ontario, for the coming year, and I hope to see their selection confirmed by the unanimous vote of this convention.

Your board of directors of last year found it necessary to appoint two public prosecutors to help in checking the wide spreading practice of sending adulterated milk to factories, and Messrs. Frank Brenton, of Belleville, and Alfred Street, of Kemptville, were selected for the work. They both proved themselves men well qualified for the positions and their work was very satisfactory to your board.

I therefore append a list of our members for the year 1908, each of whom were entitled to a copy of the official organ of the Association, known as the "Canadian Dairyman and Farming World," the name of which is changed to that of "Farm and Dairy" for the present year. Each of our members for this year will be made subscribers of this journal, which is published weekly in the interests of farm and dairy as its name indicates.

I have discharged the duties of secretary devolving upon me during the year just past with such ability as I possess, but the task has been lighter than it otherwise would have been on account of the kindness and forbearance of a well wishing board of directors, which were always ready and willing to lend their assistance. To them I tender my thanks for their kindness.

The CHAIRMAN: It has been moved by Senator DERBYSHIRE, and seconded by Mr. KIDD. "That the very able report we have had from our Secretary be adopted. I am sure we are pleased that we have a Secretary who is able to give us such a very complete report as we have had here to-day. It takes a few months to get the report printed and distributed, but they all come around in time, and I am sure it will be quite an addition to the records of the Association." The report was received and adopted.

Moved by Senator DERBYSHIRE, seconded by E. KIDD, "That this Association having heard with regret of the resignation of Mr. J. W. Mitchell, as Superintendent of the Kingston Dairy School, desires to place on record its deep sense of approval of the excellent, effective and valuable work accomplished on behalf of the dairy interests of Ontario by Mr. Mitchell during the many years he was connected with the dairy interests of this Province, and to extend to him our hearty congratulations upon his appointment to that important position that he now holds on the staff of the Manitoba Agricultural College, and to wish him all possible success in his new work." Carried.

AUDITORS' REPORT.

We, your auditors, beg to report that we have examined the books and vouchers of the Treasurer of this Association, and are pleased to say that we have found them correct in every particular. We find the

Receipts	$5,377 19
Expenditures	5,150 09
Balance cash on hand	$227 10
The following shows the assets of the Association:—	
Stock in Farm and Dairy	$1,000 00
Cash on hand	227 10
Typewriter	25 00
We found the Treasurer holding	$1,252 10

Vouchers for every item of the expenditures during the year, all of which were produced and examined by us. We found the Treasurer's books correctly kept as well as neatly. All of which we respectfully submit for your approval.

J. A. Kerr, Auditor for the Association.
John Hyatt, Auditor for the Directors.

REPORT OF THE ACTING OFFICIAL REFEREE FOR BUTTER AND CHEESE AT MONTREAL, 1908.

By Joseph Burgess, Official Referee, Montreal, Que.

In making a report on the official referee work from July to the end of the season, I may say that I gave certificates on 115 lots of cheese, containing 5,486 packages, and 40 lots of butter, containing 1,540 packages. I also examined a few lots of cheese without orders from the salesmen and reported to Mr. Publow on the quality. I found 13 per cent. of the cheese examined first grade, 81 per cent. second grade, and about 6 per cent. third grade and culls. The chief defects in the second and third grade cheese were as follows: 85 per cent. of the lots had one or more batches "not clean in flavor," referred to on the reports as "not clean," "fruity," "off flavor," "yeasty or gassy," "rancid," "sour-milk" and "food flavor"; 50 per cent. contained batches open or loose in texture; 33 per cent. with too much moisture; 23 per cent. acidy and mealy; 8 per cent. acidy and moist; 20 per cent. uneven or too pale in color; and 29 per cent. uneven in size, stained ends and poor finish.

Objectionable flavors is the most serious defect, which is, no doubt, largely due to the condition of the milk when delivered to the factories. Then some of the lots had too much moisture, which would make these flavors more pronounced, especially in fruity and off flavored cheese. A small percentage referred to as "sour milk flavor" seemed to be caused by strong flavored starters, while 4 per cent. were described as "food flavors."

I frequently found that when a lot was open and loose, one or two batches showed "sweet holes," and I judge from this that some of the makers were running their curds a little on the sweet side. Salting the curds too soon seemed to be one of the main causes of this defect.

From the 15th of September, many of the lots were soft and pasty, or contained too much moisture, indicating that the curds had not been sufficiently cooked or stirred dry enough. I suppose one of the main reasons for this was the scarcity of water, which would decrease the milk supply and increase the fat, making it necessary to give the curds a more thorough cooking.

Then we had acidy and mealy texture with pale color, which are rather common defects in the hot weather. There were also a few lots with a dry, rough texture, or cheese that seemed to be lacking in fat, showing over cooking and heavy salting.

Later on in the season, we had acidy and moist cheese. I can understand that acidy and mealy texture might be due to over-ripe milk and heavy salting, but this latter defect seemed to be caused by bad management in the making.

On the whole, the finish of Ontario cheese was fairly good. There were a few lots with stained and checked ends, and during the fall some of the cheese did not seem to have been turned in the hoops in the morning. A

few lots were uneven and undersized, and I generally found that these small cheese had too much cotton over the ends, with the boxes considerably higher than the cheese. If the boxes are large enough, the cheese should be made to weigh between 80 and 85 pounds. The weight should be put on neatly with a stencil near the lower band and close to the lap on the box.

I found 32 per cent. of the butter examined first grade, and 68 per cent. second grade. The chief defects were in the flavor and color. Nearly 90 per cent. had one or more churnings "not clean;" about half of these could be described as an "old cream" or an "over-ripe cream" flavor. 40 per cent. contained packages which were either mottled, cloudy or irregular in color. During the hot weather a small percentage of the lots were greasy, showing high temperatures in churning and working. 19 per cent. were not finished neatly, and a few lots had mould on the parchment paper.

At the Eastern Dairymen's Convention last year, Mr. Barr referred to the system of inspection in the warehouses, and recommended a system of numbering the different batches of cheese and churnings of butter. He stated that the present system of selecting a small percentage from a shipment and judging the quality of the whole lot by these few samples was not in the best interests of the trade and did not seem to be fair either to the buyer or the seller. I quite agree with this, for I believe that many lots are passed which contain some packages not up to the standard, while on the other hand, whole shipments are turned down or objected to when only one or two batches are not right. The inspector cannot tell whether he has a representative lot or not, and personally, I think it is one of the most unsatisfactory jobs I ever tackled, to attempt to give a fair report on the quality of 50 or 100 boxes of cheese by examining 8 or 10 packages when the only marks on the cheese or boxes is the factory brand and the weight. If the different batches were numbered, one could see a sample of the whole make and give a correct report on the quality, and if the percentage of faulty packages was not too great, these could be picked out and the cut in price made only on those of inferior quality. I regret to say that the cheesemakers did not seem to approve of this system, because I only found 4 lots with the boxes numbered and such a high percentage of these were faulty, varying from 69 to 100 per cent., that I classed them as second grade; but let me tell you the experience of the buttermakers. 18 per cent. of the lots or 32 per cent. of the total packages were numbered. Now, 70 per cent. of these, and only 12 per cent. of the unnumbered packages were classed as first grade, which should be sufficient evidence to the buttermakers at least that numbering the packages is a great advantage and that it rests with them to put the system of inspection on a more satisfactory basis.

I do not know any reason why it should not be just as great an advantage to have the batches of cheese numbered. As a matter of fact, only three lots of cheese were classed as straight first grade, and by picking out one and two batches in 12 lots, it raised the percentages of first grade cheese to 13 per cent. of the total. Some of these lots had the date on the cheese and by taking the boxes off the samples I was able to see a fairly representative sample of the lot.

In dating the cheese, it would be much better to put the date on the end. Then it would not be necessary to take the boxes off to look for the distinguishing mark. But the only proper way is to number the boxes, which should not take a great deal of time if you have a set of one-half or three-quarter-inch rubber stamps. If you have two vats, number the first day's make 1 and 2, and the next day 3 and 4, and so on until the end of the week. It is only by adopting such a system as this that you can expect to get an

accurate report on the quality, and it should put the system of inspection at Montreal on a basis which would be fair to all parties concerned.

In closing, I want to make one or two suggestions in connection with grading cheese and butter. The first is that there should be an understanding between the dealers and salesmen in regard to the maximum percentage of numbered packages which might be faulty and yet make a distinction in grading. At the present time there does not seem to be any understanding or rules for the guidance of the referee, and the question arises, would it be fair when 70 or 80 per cent. are defective in quality to make any diference in the grading?

The second suggestion is that a change be made in a clause in the standards for grading cheese and butter, which reads as follows:—

"If there are not more than 15 per cent. of defective cheese in any lot, the inferior ones may be sorted out and classed separately. If more than 15 per cent. are defective the classification may apply to the whole lot."

Now, 65 per cent. of the lots I examined contained under 49 boxes. If one cheese in the samples was faulty, it meant that one batch was wrong, which would be more than 15 per cent. of the total, and I would suggest that 15 be changed to 17, which would allow for one batch being defective. In cases where cheese are numbered or dated on the ends, so that the different batches can be picked out by taking the covers off the boxes, I think this percentage should be increased to allow for two batches being defective.

The change from 15 to 17 is not of very great importance and it would not have any effect on the grading during the past season. The main object in referring to this clause, is to suggest that the percentage should be increased to allow for two batches being defective in lots which have a distinguishing mark on the end of the cheese.

A MEMBER: Do you think it would be a good way to number the cheese or just to put the number on the box.

Mr. BURGESS: The number should be on the box, because, when they are taking the cheese into the warehouse it is easy to set one box to one side. If the number were on the cheese it would be necessary to take off the covers. It would be a good idea to have the cheese numbered as well as the boxes, because if the boxes happen to be taken away they might possibly get mixed up. They should be numbered just as soon as they are put into the curing-room.

A MEMBER: Do you think there would be any danger of the stamp rubbing out after it is put in the curing-room?

Mr. BURGESS: I have made cheese for fifteen years, and I never made a cheese that I did not date, and I never found it rubbed out.

A MEMBER: Do you number each vat as it is made daily? Suppose you had ten or fifteen cheese would you put the number on each vat?

Mr. BURGESS: If you had three vats the first day's cheese would be one, two, and three and the next day's cheese three, four and five.

A MEMBER: There are a number of factories that only make one batch a day, and other factories make thirty vats a week, and I do not think your percentages would be right.

Mr. BURGESS: A factory that is using one vat would probably make seven or eight cheese, and there is no reason why the man that has a large factory should have an advantage over the man in a small factory; because, you cannot make over eight cheese in a vat. I do not see how it would make any difference.

A MEMBER: A small factory would only be making six batches a week, and you suggest picking out two batches.

Mr. Burgess: The same number works on the present percentage; it would refer to small factories as well as large. I do not propose it should refer to small factories alone. If there is any better suggestions, I would be glad to hear it.

Senator Derbyshire: I am glad to say that any reports Mr. Burgess has made, when it has been carefully examined by others has been found to be perfectly satisfactory, and we feel satisfied that the work he has done has been of great advantage to the people of Eastern Ontario. When we have got a report on the cheese that has been sent to Mr. Publow with the speed of an arrow, the inspectors at the factory have a chain of communications, so that we can send direct to any man who is making poor cheese in any part of the district. The very first lot of poor cheese that comes to Montreal is reported to the Chief Inspector. I think Mr. Burgess is an important official, and his report is important and I am surprised that a great many more questions are not asked; because, in the summer time we have murmurs from the boys about this official referee. Now is the time to talk to him face to face.

Mr. Barr: When Mr. Burgess was appointed he had my sincere sympathy. There is one thing about his report that I like very much, and that is the fact that he did not examine as many cheese as I did; and that shows that cheesemakers are doing better work than formerly. I often felt uneasy and dissatisfied sitting around in Montreal with nothing to do; but I knew as long as I sat in the chair it was a good thing for the makers in the country. I am very glad that Mr. Burgess had not as much to do as I had; it is a good thing for the business. We will still need to have a man there to do the work, but I would only be too glad as the seasons roll on if it will be unnecessary to have anybody in the position. That is what we hope for. There is just one thing about this work that I regret, and that is the fact that the cheesemakers and buttermakers of Ontario have not seen the advantage of marking each batch of cheese and butter. We cannot give an accurate report until they do so; and if you were down there for a little and saw what you felt in your bones was wrong, and that you could not assist simply because you could not get at these cheese to examine them as you wanted to, then you would see the necessity for having the cheese marked. I suppose some makers hope that they will have a batch that will slip through. I think that is dishonest.

Senator Derbyshire: If you slip through a lot it comes back to you from England. Every one of these cheese is numbered and marked and it will come back to your factory, and it will be known what you are doing. You would not believe that a man would fill cheese in 1908. I do not believe there is a man here that would have thought that anybody would be so stupid as to fill cheese in 1908, and yet we had one factory that did it, and the cheese were shipped to London. I will tell you how the thing was done. He had a batch of poor culled cheese, and he cut them up and put a chunk in the centre and filled the sides and top and bottom. The people in England and Montreal wanted to arrest him for fraud; but he was a good customer, and I could not afford to have any trouble with this man. I called him up by telephone, and told him I had a very bad report. I had him come in, and he said, "If there is anything wrong settle it and I will fix it up." I told him it was a serious matter; that I know positively he did this thing, and that $200 would settle it. It was settled, and there has not been a word about it; and I want to say to you how foolish he was in doing such a thing. If he had numbered the vats, that lot could have been selected out and set to one side. Do not put your brand on a poor cheese; send them in and sell them for what they will bring. I have had some cheese from a

factory in the Brockville section for 26 years, and never got a poor cheese. We should place ourselves above the ordinary people of Italy and New Zealand, and place our goods in such a position that others will feel that they have to come to Eastern Ontario and particularly to the Brockville section for the things they have got to have on the English tables.

I wish we could get rid of these tumble down factories and have them consolidated into one large factory, where we could have everything up-to-date and in first class order. Then we would have nothing but fancy cheese in this eastern section. We have fined people over $2,000 for watering milk, and yet I want to say that a man that watered his milk this year was not such a very great sinner. He did not do half the damage to the factory that the man did that neglected to take care of his milk; because, putting in the water did not injure the milk. And yet they put him out of the synagogue because he only took 18 cents from the factory; but here is another fellow that sent dirty milk, and it will take three pounds more milk to make a pound of cheese than it would have taken if he had sent clean milk, and there is a loss of $15 on account of this dirty milk. Yet they will elect him reeve of the township, and raise him up in the church and make a great name for him. (Laughter and applause.)

A MEMBER: I would like to ask how many times during the season you are called in to examine cheese, and you notice these cheese were from no particular factory, or from a total shipment of 400 or 500?

Mr. BURGESS: Usually they were just from one factory, and they were one week's make. I did examine one lot that was two weeks make. I made 115 inspections and gave 113 certificates. Some lots I examined half a dozen times; other lots I examined only once. I must have an order from the salesmen of the factory before I examine a cheese.

A MEMBER: I believe our official referee has made a good suggestion as to numbering the cheese, not only for his own benefit, but it would assist the buyers. You will often go to a factory and find the cheese bored very badly, and if they were numbered it would not be necessary to bore them all.

A MEMBER: As a matter of fact, when our official referee is called in to examine a lot of cheese is his decision final?

The CHAIRMAN: No, only it satisfies the maker and the men in Montreal. If the factory salesman is not satisfied, he can take his cheese out and hand them to another buyer without any expense to him; but if the cheese are fine cheese then the buyer must pay for them.

Mr. BARR: I always found the merchants of Montreal accept the referee's decision without a word, even if the decision is against them. If the referee found that a lot of cheese that had been rejected were first class, the merchants of Montreal never disputed the referee. "That settles it, we will have to accept the cheese because you say so."

A MEMBER: While we understand Mr. Burgess does not examine all the cheese, does his work enable him to say anything about the output this year as compared with last?

Mr. BURGESS: No; I only saw the cheese that I had to report on.

Senator DERBYSHIRE: We have had the best quality in 1908 that ever went to Montreal or to the Old Country. That is positively a fact. We had more cheese that were of finer quality, and a higher percentage of fancy goods was made in 1908 than ever was made in the history of Canada, and I know what I am talking about.

A MEMBER: If Mr. Burgess was called on a less number of times in 1908 than the official referee was in 1907, that is the best indication that there were a less number of bad cheese.

The Convention was then declared adjourned.

Dairymen's Association of Western Ontario.

ANNUAL MEETING.

The forty-second Annual Convention of the Dairymen's Association of Western Ontario was held at Brantford, on January 13th and 14th, 1909.

All the meetings were largely attended by patrons and cheese makers and factory owners; much interest was taken in the different lectures and addresses, and the Convention was a decided success from an educational standpoint.

PRESIDENT'S ADDRESS AND DIRECTORS' REPORT.

By John Brodie, Mapleton.

It is my privilege as President of the Dairymen's Association of Western Ontario to welcome you to our forty-second annual convention. Your presence here to-day indicates your interest in this great industry. In looking over the past reports of our Association, I was particularly struck with the sacrifice of time and money made by the old pioneers of dairying in order to secure information that would enable them to build up this industry on a sound basis and manufacture an article of fine quality. It has been pointed out many times that the success of the great dairy industry is largely due to the work of education and assistance given by the various Dairy Associations and other societies. Not so many years ago the Canadian output of dairy products was rather insignificant, when compared with some other countries, but to-day it holds a place second to none, and in order to retain its position in the markets of the world it is absolutely necessary that all interested in the production of dairy products should keep abreast of the times, and place on the market nothing but a finished article that will meet the requirements of an ever increasing discriminating public.

When the British market began to recognize Canadian cheese and butter, the Provincial Governments immediately took steps to aid the industry. By practical legislation, means were put at the disposal of the makers and producers to enable them to produce an article that this market required.

Agricultural societies were started, the Agricultural College was built, Dairymen's Associations and Dairy Schools provided, and finally during the past five years a thorough system of dairy instruction and organization was adopted.

The Federal Government also legislated to improve the transportation facilities of dairy and other farm products by a more complete system of cold storage and transportation on railways and steamships, and doing everything possible to place these products on the world's market in the best possible condition. Every aid has been given so that the finest goods might be produced at the smallest cost.

We desire to express our appreciation of the interest shown by the Hon. Ministers of Agriculture for Ontario, both past and present, in the welfare of the dairy industry, and to acknowledge the substantial financial assistance

which the Government continues to place at the disposal of the Association. We also wish to acknowledge and show our appreciation of the adoption of the present system of dairy instruction, which we believe to be one of the greatest advanced movements in the history of the industry, helping us to produce a superior and more uniform quality; and this, we are certain, will in time, if continued, place our cheese and butter factories in a sanitary condition equal to if not superior to those of any other dairy country, and will bring about the needed improvement in the milk supply as well as continue to improve the quality of our dairy products.

According to the trade returns, it is shown that the amount of cheese exported from the whole of Canada for the season of 1908 is reduced about 154,000 boxes. This is no doubt due to unfavorable climatic conditions which prevailed in different parts of the cheese producing sections, both in 1907 and 1908. Increased home consumption has had a marked effect on the exports, particularly that of butter. The increased consumption of milk and cream in our various cities whose population is rapidly increasing also has its effect. Notwithstanding this decrease in export trade the producers received through higher prices nearly as much total money.

From Census Statistics Bulletin 7, we find that for the Province of Ontario, from the year 1900 to the year 1907, there was a decrease of the total amount of cheese made in Ontario, amounting to 1,137 tons, but while the value of the larger quantity in 1900 was $13,440,987, that of the smaller production in 1907 was $15,106,030, or $1,665,043 more, owing to the larger price obtained per pound. In the manufacture of butter we find that in the same period there was an increase of 651 tons, with an increase in value of $592,522. However, we wish to emphasize the point, that it is not so much an increased price that we should look to for future increase in profits but an increased production from the individual cow.

Coming now to Western Ontario, with which we have more particularly to deal, we find that in 1907, we produced 16,827 tons of cheese and 2,932 tons of butter. From reports of the Instructors and from other reliable information, we find that although two more milk condensers were established in our best dairy districts in 1908, still the production of cheese was maintained and in some sections increased, and the production of butter increased by 338 tons.

We can therefore assure you that the production of cheese and butter in Western Ontario in 1908 shows an increase rather than a decrease.

Several new factories will be erected before the next season opens, some of these in sections where formerly the co-operative factory system had not to any great extent been in vogue; but we must deplore the fact that several of these factories are to be built in sections already well served by existing factories, and we fear that the building of these small factories in districts where the facilities seem adequate is not in the best interests of either the producers, manufacturers, or the trade in general.

Notwithstanding anything that may be said or written to the contrary, we believe that the raising of bacon hogs is a profitable adjunct to the cheese and butter making industry, and when combined is the most remunerative and staple branch of agriculture in practice in Western Ontario at the present time. We, therefore, beg to point out to the producers of milk that it would be well to think seriously and look into the matter closely before discarding the bacon hog industry.

It might here be mentioned that some attempt has been made by a few factory men during the past year to introduce a system of manufacturing skim milk cheese. So far as we can learn the enterprise has not been successful from a monetary standpoint, either to producer or manufacturer, and we

wish to place on record our disapproval of such a system, as it is only by the production of the highest quality that we can hope to maintain our prestige as a cheese producing country.

The prospects for the future of the dairy business in Western Ontario are bright, and so long as we can furnish goods of satisfactory quality our dairy products will continue to meet the approval of the consuming public, both at home and abroad.

Your directors decided to again hold a cheese and butter exhibit in connection with this Convention, and a large number of entries shows the appreciation of the members as far as this feature is concerned. It is generally recognized by every person in the trade that the yearly dairy exhibition is an educative feature along the lines of uniform manufacture. We feel that the general fine appearance of Western Ontario cheese and butter when marketed is due to some extent at least to the educative influence of these dairy exhibits.

The Dairy Herd Competition was continued, the Association donating $100.00 in cash prizes. The number of entries are not large, but it is believed the benefits of this competition are widespread, and has been a means of stimulating the patrons of factories to a greater production of milk per cow, and gives an object lesson of what may be accomplished in the way of profits by proper feeding and keeping cows of heavy milking capacity.

The Ontario Department of Agriculture very kindly allowed us to send out speakers to annual meetings during the winter of 1907 and 1908, and this work has accomplished much good. The Department paid for services of the speaker, and your Association paid the travelling expenses. This work will be continued this year.

The system of handling cases of adulteration of milk worked out so well, that the same system was continued. A special officer was appointed to deal with these cases, and the work was carried on along similar lines as last year.

In conclusion your directors wish to emphasize the idea, that in order to accomplish many things we must have an ideal to which we wish to attain. At the beginning of a new season, at this Convention let that ideal be "perfection." We must adopt modern dairy practice. New discoveries are being made in every profession; yesterday's information will not do for to-morrow's emergencies. Always remember that the world generally gives its admiration not to the man who does what no person else ever attempts to do, but to the man who does best what the multitude do well.

We trust you will have a profitable and enjoyable time while at this Convention.

The CHAIRMAN: I have very great pleasure in moving the adoption of this report.

Mr. PAGET: I beg leave to second the motion.

The motion was carried.

FINANCIAL STATEMENT.

The financial statement was read by Mr. FRANK HERNS, and upon motion of Mr. J. J. PARSONS, seconded by Mr. J. M. PAGET, it was received and adopted.

REPORT OF DAIRY HERD COMPETITION, 1908.

The following report was read by the Secretary:

Your directors decided to again promote a Dairy Herd Competition, donating $100.00 in cash prizes for patrons of cheese factories and creameries in Western Ontario. Ryrie Bros again very kindly donated a Silver and Bronze Medal. The prizes offered and the rules of competition were as follows:—

Two Diamond Hall Medals, (enclosed in handsome cases), donated by Ryrie Bros., Toronto.

$100.00 in cash prizes, donated by the Dairymen's Association of Western Ontario to patrons of cheese factories and creameries.

A Silver Medal and $15.00 in cash, to the patron who furnishes the largest amount of milk per cow to any cheese factory in Western Ontario from May 1st to October 31st, 1908.

$15.00 in cash, to the patron who furnishes the second largest amount of milk per cow to any cheese factory in Western Ontario from May 1st to October 31st, 1908.

$10.00 in cash, to the patron who furnishes the third largest amount of milk per cow to any cheese factory in Western Ontario from May 1st to October 31st, 1908.

$6.00 in cash, to the patron who furnishes the fourth largest amount of milk per cow to any cheese factory in Western Ontario from May 1st to October 31st, 1908.

$4.00 in cash, to the patron who furnishes the fifth largest amount of milk per cow to any cheese factory in Western Ontario from May 1st to October 31st, 1908.

A Bronze Medal and $15.00 in cash, to the patron who furnishes the largest amount of butter-fat per cow to any creamery in Western Ontario from May 1st to October 31st, 1908.

$15.00 in cash, to the patron who furnishes the second largest amount of butter-fat per cow to any creamery in Western Ontario from May 1st to October 31st, 1908.

$10.00 in cash, to the patron who furnishes the third largest amount of butter-fat per cow to any creamery in Western Ontario from May 1st to October 31st, 1908.

$6.00 in cash, to the patron who furnishes the fourth largest amount of butter-fat per cow to any creamery in Western Ontario from May 1st to October 31st, 1908.

$4.00 in cash, to the patron who furnishes the fifth largest amount of butter-fat per cow to any creamery in Western Ontario from May 1st to October 31st, 1908.

The above prizes are subject to the rules of competition as shown below.

Rules of Dairy Herd Competition.

1st. No herd of fewer than eight cows will be allowed to compete.

2nd. Figures must be taken from the cheese factory or creamery books, and the number of cows and the total and average amounts of milk or butter-fat must be certified to by the cheese or butter-maker, and the secretary of the cheese factory or creamery.

3rd. The average amount of milk or butter-fat per cow must be calculated on the basis of the total number of cows from which milk or cream is sent to the factory during the season of six months, May 1st to October 31st, 1908.

4. No substitution of one cow for another will be allowed.

Note.

Example 1.—If the patron begins to send milk or cream to the factory on 1st of May from say eight cows and continues to send to the 31st of October from the same herd he is eligible. Larger herds the same.

Example 2.—If the patron begins to send milk or cream to the factory on 1st of May with say only seven cows in milk, and in June, or at any other time, another cow freshens, and in July, or at any other time, another cow freshens, making in all nine cows, the patron is not barred from competing, provided the total number of cows (9), is used for dividing the total milk or butter-fat to find the average amount of milk or butter-fat per cow for season. Larger herds the same.

Example 3.—If the patron begins to send milk or cream to the factory on May 1st, with say eight cows, and in June, or any other time in the season, for some cause, one cow drops out of the herd, the patron is not barred from competing, provided the total number of cows (8) is used for dividing the total milk or butter-fat to find average amount of milk or butter-fat per cow for season. Larger herds the same.

Example 4.—If the patron begins to send milk or cream to the factory on May 1st, with say eight cows in the herd, and some time during the season, for some cause, one or more cows drop out of the herd, the patron will not be allowed to substitute a new milch or any other cow in order to keep up the milk from the herd. Larger herds the same.

A Director of the Association or one of the Instructors visited the farm of the winning competitors, examined the books of the Secretary of the respective factories, and satisfied themselves so far as possible that each competitor had complied with the rules and regulations.

The prizes were awarded as follows:—

Class 1, Sec. 1.—Cheese Factory Patrons.

1st. Jno. W. Cornish, Sprucedale Farm, Harrietsville, 8 Holstein grade cows, 57,949 total pounds of milk, 7,234 pounds of milk per cow, $548.02 total money, $68.50 money per cow.

2nd. Seymour Cuthbert, Aberdeen Farm, Sweaburg, 14 Holstein cows, 100,808 total pounds of milk, 7,200 pounds of milk per cow, $946.19 total money, $67.58 money per cow.

3rd. W. E. Thomson, Leslie Farm, Woodstock, 11 Holstein and Holstein grades, 77,066 total pounds of milk, 7,006 pounds of milk per cow, $653.92 total money, $59.44 money per cow.

4th. Geo. W. Pearce, Hillside View, Tillsonburg, 14 grade Holstein, 1 grade Durham, 15 cows, 96,021 total pounds of milk, 6,401 pounds of milk per cow, $926.52 total money, $61.76 money per cow.

5th. Mason Bros, The Maples, Tyrell, 20 Holstein and Holstein grades, 125,322 total pounds of milk, 6,266 pounds of milk per cow, $1,057.50 total money, $52.87 money per cow.

F. W. Woodley, Fairview Farm, Boston, 5 pure Holstein, 3 grade Holstein, 8 cows, 48,725 total pounds of milk, 6,090 pounds of milk per cow, $440.83 total money, $55.10 money per cow

J. W. Earley, Pleasant View, Kerwood, 11 grade cows, 52,690 total pounds of milk, 4,790 pounds of milk per cow, $491.80 total money, $44.70 money per cow.

Alfred Thomas, The Maples, Golspie, 14 grade Durham, 55,673 total pounds of milk, 3,976 pounds of milk per cow, $586.45 total money $41.89 money per cow.

Class 1, Sec. 2.—Creamery Patrons.

1st. R. M. Bowie, Maple Lane, Beachville, 11 common grade cows, 2,195.5 total pounds of fat, 199.6 pounds of fat per cow, $640.27 total money, $58.21 money per cow.

2nd. Frank Wright, Kerwood, 14 grade Durham, 1,779 total pounds of fat, 127 pounds of fat per cow, $429.81 total money, $30.70 money per cow.

W. E. Thompson, one of the winners, being called upon by the President for an address said: I am sure I am pleased to be with you this afternoon. You will remember that for the last two years I have been a competitor in this Dairy Herd Competition, and last year I was fortunate enough to get a medal. As far as I was concerned I made up my mind that this year I would not try for it. I did not feel that my herd was in shape to start out another season and try to win a prize in this competition. I had a little bad luck with one of my cows, which I could not avoid. However, I saw Mr. Herns in Toronto, and later on at the Dairy District meeting in Woodstock, and he urged upon me to try again, and finally I decided to enter this year. Therefore you can see that I made no preparation whatever, and took no special care of my stock. Last year some thought that I had fed more grain or expensive feeds than I got returns for, and this year I thought I would just feed my cows in the shape that I thought would be profitable. Last year I fed considerable more grain that I did this year. This year I fed nothing until about the fore part of July, when I started to feed 1 pound of bran and 2 pounds of meal twice daily until the first of November, amounting in all to about $75 in round figures. That is not a great amount of money to spend for mill feed. I was

a little short of pasture, and was handicapped in not having a silo. I have not made a practice of growing lucerne or peas and oats or any crop of that kind. I am only a common man, starting honestly in business, and it takes time to get these things. I am putting up a silo, and expect to have it for next year. I think lucerne or silage are necessary things to produce milk for cheesemaking. I did not know I was going to be called on, and not being a public speaker, cannot speak off-hand, but if there are any questions you would like to ask, I will try and answer them as best I can.

Q.—What breed of cows do you keep? A.—Holstein.

Q.—Holstein grades? A.—About half of them are pure-breds, the balance of them grades.

Q.—The only supplemental food you fed was grain? A.—The bran and the meal and the balance was pasture.

Q.—What amount of meal do you feed? A. Mostly oats. I did feed a little bit of chop and a little bit of oil cake at one time when the oats got short.

Q.—Do you weigh each individual cow's milk? A.—Yes.

Q.—What did that amount to per day? A.—I could hardly tell you off hand.

Q.—What did the best cow give? A.—Do you want figures for the season or the milking season of 10 or 11 months? The first cow was 9,538 pounds. There are some of them that are milking yet.

Q.—Up to what period? A.—End of December.

Mr. THOMPSON: Here are some of the facts relating to my herd, in detail:

Cow No. 1	freshened	26th March,	9,538 lbs.		
" 2	"	25th "	12,484	testing	4%
" 3 (2 year old heifer)	"	15th January,	10,726	"	3.8
" 4 (11 year old)	"	15th February,	11,952	"	4%
" 5 I had one idle cow.					
" 6 (3 years old)	"	January 1st	12,930	"	3.6
" 7 (5 years old)	"	February 15th	11,192	"	3.3
" 8 (5 years old)	"	March 25th	10,828	"	3.3
" 9 (7 years old)	"	June 16th	7,526	"	3.8
" 10 (2 years old)	"	March 15th	9,278	"	3.1
" 11 (4 years old)	"	March 1st	13,490	"	3.7
" 12 (7 years old)	"	March 22nd	10,530	"	3.4

Q.—Is that the average test for the milking period? A.—Yes, the average test.

Q.—Would you mind telling us how you got the Holstein test so high? A.—I do not know why it is that they vary so, it must be in the individual cow. I have been connected with a Cow Testing Association two years, and every year I have heifers coming on and the cows that make a poor test are discarded and the better ones are kept.

Q.—Then you are pursuing the method of selecting with the object of increasing the better ones? A.— Yes, having regard to the amount of milk they give as well as the test.

Q.—Do you think you can do that if you do not test the individual cows?

A.—No, I do not see any other way of getting at it.

Q.—Which give you the best returns, the pure-breds or the grade cows?

A.—I had a three year old pure-bred heifer that gave something over 12,000, very nearly 13,000, testing 3.6; I think if that was figured out in fat it would be a large percentage.

Q.—She milked longer than the others?

A.—Yes.

Q.—How did she average with the others?

A.—Much about the same.

Q.—How did you feed these cows before they went to grass?

A.—After they freshened they were fed roots twice a day, hay in the morning, and I cut corn after I had it at noon, and straw at night, and meal twice a day.

Q.—How much meal?

A.—About a gallon of meal. The greater part of that would be oats or bran mixed with heavier grain.

Q.— Did you feed any green corn?

A.—Yes, as soon as the corn was fit to cut they were fed liberally until they were tied in the stables.

Q.—What is the value of that two year old heifer?

A.—I have her placed at a value of $250, and she is not for sale at that. I find that the pure-breds are very nearly one-third better than the grades, judging from the heifers that are coming in from time to time.

Q.—Do you use a fly repellent when they are on pasture?

A.—Yes, we use Dr. Williams' spray. You can buy an ordinary hand spray pump for about 40 or 50 cents which will do you for two or three years, and this year all I used for spraying was a gallon of Dr. Williams' spray divided into two halves and added another gallon of coal-oil. I thus made it more cheaply, and it was just as efficient. I think there is one of the secrets of getting milk.

Q.—How frequently do you spray the cows?

A.—Every night. I made a practice of tying them in; spraying them before the pails were brought to the stable to milk. Somebody might object to this on account of the flavor in the milk, but if you close the stables and spray your cows and then open the doors, the spray odor passes out, and I have never found any trouble. The reason I spray before milking is that I think the great part of the value of spraying is in the comfort of milking, to say nothing of the protection which comes to the cows.

Q.—What variety of corn do you use?

A.—Compton's Early and Longfellow. I try to get my corn in so that I can start to feed pretty early. I like to have it cobbed pretty well as soon as I can get it.

Q.—How much profit do you calculate to clear on each cow after your feed is paid for?

A.—Take it for the whole year, it would be pretty difficult to get at, because I made no estimate of the whole year's feed; but there certainly is a profit.

Q.—Are you feeding your herd for butter-fat or for milk?

A.—Both.

Q.—You have no specialty?

A.—No. I might say that I am striving to get a little more butter-fat, if possible. At our factory my returns were low in proportion to the milk sent in; that is because our factory is paying by the butter-fat test, and there is a lot of Jersey milk sent in there, and it makes the average high so that with the Holstein I come below the average, and that reduces the amount of my money. If the milk was sent in on the pooling system my returns would be considerably more, although I cannot say that I am afraid of the testing system.

Q.—What date of maturity was the corn when you started to feed it?

A.—Just as soon as it was about 4 feet high. I always have plenty of it, and I cut it about the 15th of September, when we get it for the corn binder. I can always tell by the milk pail whether there is something in the corn for the cows or not. (Applause.)

Mr. Mason, another of the herd contestants, was called upon to speak, and after referring to his youthfulness, said: In the first place we have quite a large herd, and we have been in this competition for three years, and they had to extend the prize list to give us a show. They gave five prizes, and we happened to get the fifth one. Still, we are quite pleased at that, because it means quite an effort to get a herd in sufficient condition to win a prize at all. My brother and I work together; he is older than I am, and I would have preferred that he should have been here to have spoken for us. He is a married man, and has lost a little of his hair, and you would expect him to be wiser. (Laughter.)

Our father should have the credit of having the good herd, but he is not with us now; and we have taken the same herd and followed on with them, and every year they have improved somewhat. They are all Holstein and Holstein grades, and by careful selection from year to year we have improved them, and I believe they can be improved yet to a great extent.

At the present time we are trying to work in the pure-breds. We have some, and they have proven very satisfactory. They have a far larger capacity than the grades; they are a larger and a stronger cow.

We have always grown everything on our farm that we feed the cows except a little bran, and nearly every year we have sold some grain. Everything that the cows have made for us has been clear profit, but to figure out how much the clear profit has been from year to year is a pretty hard thing to do, because the prices vary from one year to another. I always think that when we produce everything on our farm the most important point is the price we get for it when we sell it.

Q.—What is the principal summer food?

A.—As summer food in the first part of the season we feed a little mixed grain, oats, and barley chop. This year we fed a little all summer. We hadn't anything in the way of green food until the corn was large enough to cut, and then we commenced feeding green corn. As Mr. Paget said last year at the Farmers' Institute meeting that he believed it would be far cheaper to have a silo and feed silage, but we have never had one until this year, and that is something we are going to do. We are going to feed corn early in the season. Mr. Clement, of St. George, was at our farm this summer when we first commenced feeding, and he rather wondered whether there was anything in it or not; but I think he was convinced that it helped to hold our cows at a steady rate. From the time we started feeding them I do not think they varied from 5 to 10 pounds a day for the whole herd, and I am sure we could not have done that last fall when it was so very dry and the pasture didn't grow after the middle of August.

Q.—What is your method of selecting your cows?

A.—In the first place we raise calves from our best cows and keep pure-bred sires of the best stock we can get, and the last few years we haven't had a heifer that has not been first-class. Our cows are all good stock now, and we have had no trouble for several years.

Q.—Do you weigh the milk?

A.—Yes, we have been in the Cow Testing Association for two years.

Q.—That is where you ascertain the good cows?

A.—Yes; and that, I think, creates a surprise at the end of the season, because when we are totalled up at the end of the season, some of the cows that didn't give nearly so much in June and July gave a steady flow in the fall, and they made us more money than the others, because it is during September, October, and November that the milk is always worth the most money.

The following letter was received from Mr. John W. Cornish, Huntsville, winner of the first prize in the herd contest:

DEAR SIR,—Yours to hand informing me that I had won first prize in the Dairy Herd Competition. I wish to thank the president and directors for the very satisfactory way in which they have handled the competition this year.

As it is impossible for me to attend the Convention this year, on account of sickness in my family, I will briefly outline how I handled my herd during the past season. My herd consists of eight grade Holsteins, one of which is a three year old heifer. Three of my cows freshened in March, the other five during April and the first week in May.

About three weeks before freshening I gave a ration consisting of ensilage, straw, or clover hay, and about a pint of oat chop, with a little oil cake added. Of course the grain ration varied according to the condition of the cow.

After freshening I increased the grain ration to three or four quarts per cow, at the morning and night feedings, and continued the ensilage and clover hay until they were turned out on grass, from which time I reduced the grain to one or two quarts per cow and changed to bran or shorts in place of oat chop.

I had half an acre of Hungarian grass convenient to the stable for green feed during the dry spell in the summer. I began feeding it as soon as it began to head out, and always fed in the stable morning and evening. This feed lasted until my corn crop was available. We then fed corn mornings and roots at night.

Another point that is very important is to salt and water your cows often and regularly. I salt mine three times a week, and always water during the warm weather three times a day. We always milk at the same hour night and morning, and have the same person milk the same cow.

I always send the laziest man on the farm after the cows. I generally go myself. I never allow the dog to accompany me, as I believe better results will be secured by slow driving of my cattle before milking. The more kindness you bestow upon your herd along with proper feeding, the better will your herd results be.

THE WORK OF THE COW TESTING ASSOCIATIONS.

BY CHAS. F. WHITLEY, DAIRY COMMISSIONERS BRANCH, OTTAWA.

It should be almost unnecessary to explain what a Cow Testing Association is. The work has been in existence in Canada for two or three years, and you have had two shining examples of membership in the two gentlemen who have just spoken. These two members in this Western part of the Province have captured two prizes in the Dairy Herd Competition. Notwithstanding all that has been said on the subject there are still very many men who need to learn about cow testing association work. May I say that membership is very easy. There are no entrance fees and no lodge dues. You have simply to signify your intention to weigh the milk three days during the month right through the milking season. This is not great labor, in fact it is a pleasure, and it is necessary to do it in these days of competition.

1. What is a cow testing association? As these associations have been in existence in Canada for three or four years a description of the methods employed would seem almost unnecessary. But as many men have still need to learn of them, the system may be described briefly. Members are admitted on agreeing to take weights and samples of milk of each cow in the herd at least every 10th day. The necessary time means only a bare ten minutes per cow per month. This should not be considered as any extra labor, but as much a part of the ordinary farm operations as spraying potatoes or grooming horses. The Dairy Division, Ottawa, bears the cost of testing.

2. The work is necessary because individual cows of the same breed, or in the same herd vary so greatly in total yield. Without testing it is impossible to judge what milk tests; there are hundreds of cows supposed to

give milk containing a normal percentage of fat, but which in reality tests very low—2.5, 2.2, or lower. Yields very tremendously; five individual cows in the same district in July gave yields of 540, 630, 720, 840 and 970 lb. milk. Individual cows in the same herd on the same feed vary from 2,800 to 5,600 lb. milk in the season.

COMPARISON OF 2 COWS, SAME HERD. TOTAL YIELD, 7 MONTHS.

The Most Profitable.—Weight of milk, 5,595 lb.; weight of fat, 186 lb.; yield of cheese, 509 lb.; value of milk, $55.95; cost of feed (7 months at $3), $21.00; profit, $34.95.

The Least Profitable.—Weight of milk, 2,790 lb.; weight of fat, 110 lb.; yield of cheese, 272 lb.; value of milk, $27.90; cost of feed (7 months at $3), $21.00; profit, $6.90.

This is but one instance of hundreds of such differences. Two mature animals in the same herd, both freshening in spring, give startingly different total yields, which would remain undetected unless weights are noted down. The best yield is double the poorest, therefore, many would say, the one cow is worth twice as much as the other. But as they each consume about the same value of feed the *net profit* should be considered. It will then be seen that the better cow gives *five* times as much profit, and should be rated accordingly.

3. The work was introduced here because of the remarkable revelations of records in other dairy sections of the world. Thanks to the press, the best dairy thought cannot be confined within the boundaries of any one country; it is international. When it is stated that in such sections are to be found hundreds of herds producing from 7,000 to 10,000 lbs. milk, it surely should be an incentive to dairymen here to have more records worth showing. We are scarcely yet awake to what similar records may lead.

4. What has been already accomplished in Canada has amply justified its introduction; and further, has abundantly proved the necessity of its continuance and rapid extension.

Many men can point with satisfaction to an increase of 25 per cent., 35 per cent. and 50 per cent. in the milk yield per cow. Some men have doubled the yield. One man for instance has raised his average production in two years from 4,500 to 6,100 lbs. milk, per cow, while the factory average remained at 3,400 lbs. Hundreds of farmers are now taking up the work in earnest, finding it, as they state, of immeasurable benefit.

Systematic improvement of the dairy herd cannot be made until records form the starting point. We cannot create an improved herd, we must select and develop. All the skill of the world's wise men cannot construct one cell of the millions of which the body is composed; nor weave one square inch of the delicate fabric in which the Creator has wrapped us. The best we can do is to assist—to work in harmony with—to improve—to develop. Records of production are the only sure and certain guide in selection and improvement. First must come the root of the whole matter, a personal conviction of the system's value; the branches and fruitage of higher attainment will surely follow and add a new charm to life.

A logical outcome of this record work is the formation of co-operative breeding associations, such as exist in a few localities in Quebec and some of the United States. The purpose of such associations is to procure and use pedigreed sires for improving live stock through a system of up grading. This method implies the continued use of some one kind of pure blood on the grade and mixed bred stocks. These associations oppose the admixture of the blood of several breeds, and the use of cross-bred grade and scrub sires.

5. The work is spreading and is likely to grow.

Members this year have sent in records for as many as 6,600 cows a month as compared with 2,800 cows in 1906. It appeals to the shrewd common business sense of the practical dairyman. We cannot remain content with poor records; we must progress or be out of the running: consistency is the badge of stagnation.

Record work has shown Canadian dairymen that they may reach a definite work in dairy breeding and dairy feeding. New purposes are being given, and means whereby it is possible to know when they are accomplished.

Wise men may say that there is nothing new. However, we are not living altogether in the past. The stream of time has worn a deep chasm between pioneer days and the era in which we now live. The farmer's life may be constituted of the same work-units as it was fifty years ago, but if he is performing the same tasks as his grandfathers, he is most certainly doing them in a different way, doing more in less time, and best of all, working and planning with more perfect aim, with standards to be raised and with tangible objects ahead at the goal for which he strives. Dairy records aid in clean cut work and in eliminating poor material.

6. The work assists the solution of domestic problems of farm life; it appeals to the boys and girls, riveting their interest in home economics. It induces the hired men to milk cleaner, so that from that source alone an extra 500 lb. milk per cow may be obtained. The best kept and the neatest records are evidently those sent in by some of the gentler sex, and where the women get interested, we may always count on steady improvement.

A knowledge and interest concerning the business affairs of the homestead must act as an influence towards a higher and more genuine respect on the part of the young men and women of the country for the business of farming. The home nest will be forsaken less and less by the young fledglings when it holds forth to its young people a partnership in the daily doings.

7. The work calls forth the best efforts of intelligent humanity in providing better care and attention for the most patient and hardest working species of farm stock. When the effect of cold, neglect and exposure is reflected in the records, the necessity of better treatment is forced on the owner's attention. The unfailing law of retribution, "Whatsoever a man sows that shall he also reap," applies to the housing and feeding of dairy cows. Liberality is repaid, kindness is not lost.

When the shrinkage in milk yield from one month to another attains the startling figures of 30, 40 and even 50 per cent. in some cases, while with other herds it is down to 20, 18 and 13 per cent., it makes one consider a change of methods, and such wise provsion as will secure a persistent flow.

Comparison of Average and Total Yields for Six Months, May to October.

Association.	No. of Cows.	Average.		Total Yield.	
		Milk.	Fat.	Milk.	Fat.
		lb.	lb.	lb.	lb.
Rockford	37	6,093	200	225,454	7,408
Central Smith	37	5,568	185	209,034	6,843
Warsaw	37	4,392	144	162,506	5,355

Association.	Best cow.		Poorest cow.		
	Milk.	Fat.	Milk.	Fat.	Age.
	lb.	lb.	lb.	lb.	
Rockford	7,598	237	4,090	145	4
Central Smith	9,242	317	3,670	134	10
Warsaw	5,430	165	3,270	104	8

The figures herewith indicate the astounding differences revealed on comparing total yields of groups of cows for the factory season. While 37 cows in the Warsaw Association gave 162,506 lb. milk, the same number of cows in the Rockford Association gave sixty-three thousand pounds more or nearly 3 tons of cheese extra during the same six months. It certainly pays to induce persistent flow and avoid excessive shrinkage. Further, it pays well to select good individual cows. The 8 year old cow noted above gave only 3,270 lbs. milk, but the one in the Central Smith Association gave 9,242 lbs. during the same period. Excellent records are absolutely lost sight of when only averages are considered.

8. The work is undertaken with one dominant purpose constantly in view, a study of individual cows with a view of increasing economical production. While the selling price of cheese in Liverpool, be it 45/ or 65/, is beyond the patron's control, the cost of production of milk is immediately under his eye, and can be reduced by learning what records have to teach. The selected herd can produce milk at one third the cost of many an average herd. Why not save the difference?

The promising individual must remain undiscovered unless a record is kept. Unknown to their owners, most valuable cows have been sold for a song, or even given away. A prominent magazine recently gave a photo of a cow purchased at ordinary market price from a city milkman who could not find time to test milk, or keep a milk record, and consequently never discovered her wonderful capabilities. She has a record of close on 1,000 lbs. butter; a veritable jewel of a cow, at last recognized and appraised accordingly. Another cow also unknown, unstudied by her owner, was literally given away as "just an ordinary cow." She gave over 13,000 lbs. milk last year. Who can estimate how many similar treasures have remained lost. Cold, arithmetical "averages" never detect such beauties; they level down and pry up, completely submerging the deserving individual.

Cows must "make good" nowadays or make tracks; each one must be checked up and pay up like each passenger on a train at the hand of a watchful conductor. Why should unenlightening "averages" warp the judgment or stifle enquiry as to necessary individual performance? Is it any satisfaction to a needy widow or an orphaned boy to know that the people of Canada carry $700,000,000 of life insurance? That "averages" very little per head of population; while many men are uninsured, others carry $50,000 or more. Similarly, average yields give no due credit to the star performers, while wretchedly poor cows are raised to undeserved rank.

Records disclose great variations in quantity and quality, but generally a very small difference between cost of keep and care of a cow with low yield, and a cow with high yield. Hence, in the selection of right animals is the true application of economy. The keeping of records lies at the foundation of systematic development of economy. The right animal, the selected cow, is the economical producer. If six cows will do as much as, and do even better than nine unselected, why not economize and have the prime

satisfaction in handling the better stock? In some districts it takes 200 cows to accomplish as much as 75 in other districts. The weeding out of cows with low yields is at the base of economic production. We have found in a herd of 14 cows that three made as much profit as the remaining eleven.

9. The work recommends itself to every real dairy farmer as distinguished from the man who simply keeps "just cows."

When thousands of cows in Ontario are shown to produce only 2,500 lbs. milk apiece during the cheese f ctory season, it indicates need of better methods. Other Ontario farmers in the same localities obtain 4,000 lbs. and over during the same period. Dairying to-day is real business, and not the simple farming of old days when it was just a case of selling wheat. It was then an easy matter to calculate, so many acres, so much grain, so much cash. To-day we have diversified farming, a more complicated business, crops are sold in new form, as milk or butter; the manufactured article is produced. The gross returns may be satisfactory, but profit can be largely increased if the scales and Babcock are applied to the performance of each individual cow. There is no more reason that any cow should make her living out of her owner for nothing than that a hired man should be paid wages to loaf round and do nothing. One of the most esstential points in business is to ascertain definitely where profit is made, and to stop losses.

CONTRASTS BETWEEN COWS IN 3 HERDS IN SAME ASSOCIATION, 10 MONTHS, 1908.

Herd	Poorest Yield		Best Yield	
	Milk	Fat	Milk	Fat
	lb.	lb.	lb.	lb.
A	3,610	134.1	6,590	212.8
B	5,068	243.5	9,420	316.3
C	4,618	200.6	12,960	412.1
Value of Milk	$46 12		$129 60	
Feed	40 00		50 00	
Profit	$ 6 18		$ 79 00	

NOTE.—Profit is 13 times greater with this cow.

These figures emphasize individuality, the important point to be considered in connection with the modern business herd. When it is seen that in a first class dairy section there are such extraordinary differences between cows in the same herds it is another evidence of the need of selection. While one man is retaining a 3,600 lb. milk cow and feeding her at a cost just about what her milk brings, the two other men have as their poorest, cows that gave over 1,000 lbs. milk more. And in the best yields the strides are greater still, from 6,000 up to 9,000 odd, then up to the discovery of another jewel giving close on to 13,000 pounds. Note again the difference in profit, with the 3,610 lb. cow it is practically nothing, but in herd C, even allowing $10 extra feed for the large producer, the good cow makes 13 times as much profit as the poor one.

Dairy farmers, does each one of your cows pay a profit? Do you know that she does? The way is easy, expense small, returns great. This is not book farming or theory, it's business.

Then, apart altogether from the question of profit there is a consideration which to the genuine farmer should appeal hardly less, namely interest. The work is one which makes the farmer an investigator, bringing him into closer touch with the scientific problems that underlie the practice of farming. It is in this direction that farm life has one of its immense advantages over industrial life, in the broad, living, scientific interests with which it is and should be in touch. And the cultivation of these interests makes and helps the practical farmer. The men who are following out the milk record system are not the failures in dairy farming. On the contrary, they are among the best and most successful.

10. The work is of widespread, vital interest, not merely of local importance, and must embed itself in the thought of every true dairyman.

More milk per cow proportionately lowers factory expenses.

Not only patrons, cheese makers, instructors and factory owners are dependent on the cow's production, but all merchants and bankers, etc., wish to see development. There is an interweaving of interests not lightly to be considered. Every Canadian is a consumer of dairy produce.

The echo of action is everywhere evident. We slip into the ruts of other men's deeds. One progressive man in any locality may start the good movement, wielding an influence not visionary, but practical. It takes but few men at the city power house or in the ocean liner's stokehold to make things move. But these few are necessary. The contagion of good example soon spreads. One man's constructive example transforms an ugly street into one of the brighest vistas of beauty. One good dairy herd is an object lesson and an inspiration for scores of others.

11. The work has tremendous commercial significance and is of pungent distinctiveness. The present volume of trade in milk and its products can be enormously increased even with only the present number of cows; while the augmented profits will not be retained by a few middlemen, but distributed to hundreds of farms in every province. While peaceful agricultural operations may not unlock the greatest treasure chests of the world, the distribution of wealth is more even than from gold or diamond mining. But a slight increase in milk production per cow means hundreds of dollars more to every township. It can easily mean an extra $160,000 to the county of Grenville, and an additional five million dollars to the Province or Ontario.

If this work could be forced on the attention of dairy farmers generally, and if they would really take it up seriously, it would not be too much to except that in five years' time from now, at least three-quarters of the cows would each give fifteen dollars' worth more milk,—this means an extra 12½ millions of dollars for Ontario farmers. Get busy!

12. The work is of national importance. The eyes of the world are on the 20th century's wonder, this Canada of ours, this marvelously developing Dominion. The reputation of milk producers is at stake. Will they awaken to the necessity of adopting modern business methods in the practice of their calling, and thus strengthen the very foundations of our great national industry, dairying? The influence of their progressive action will permeate each dairy section, transforming unfinished effort into glorious achievement; the scope of their activities may well be termed nation building.

"There is a tide in the affairs of men, which taken at the flood leads on to fortune," as the Bard of Avon sang, and it is for Canadian dairymen to be up and doing. Grapple with the question now, and the Dominion gains in every way immediately. With no illogical and inconclusive dreaming of the great things that might be accomplished, let each man get to work, and he will do more than command success, he will deserve it.

CATTLE FOODS.

By Prof. R. Harcourt, O.A.C., Guelph.

The study of the science of cattle feeding has received a great deal of attention during late years. Fortunately, while a knowledge of the results of the numerous investigations would be of great aid to the thorough understanding of the subject, it is not essential to success; for the practice of some experienced feeders leaves little to be desired. They probably have learned much from their forefathers, and, this together with long experience with the same kind of cattle and feeding stuffs, and the natural instincts of a feeder, has enabled them to become somewhat proficient in the art of feeding. There are, however, many farmers, both old and young, who have not been bequeathed any valuable experience, and, further, there are on the market to-day a great variety of new foods about which very little is known. Consequently there are many reasons why we should look into the question of the composition of some of the cattle foods.

Before taking up the percentage composition of the foods, let us look at the functions of the various constituents which are contained in these materials.

When we study the nature of the food of plants, we find that from such simple substances as carbon dioxide, nitric acid, water, and a few salts, a plant is capable of constructing a great variety of elaborate compounds. It accomplishes these surprising transformations by a consumption of energy (sunlight) external to itself. An animal has no such contsructive power. The animal frame is built up of food compounds which are simply transformed into similar body compounds, or it may be produced by the splitting up or partial combustion of some of the food constituents in the bdy. The animal derives no aid from external energy. The temperature of the animal body (about 100° F.) is maintained by heat generated within the body by combustion of materials eaten as food. The energy required for masticating food, pumping blood through the system, walking, drawing loads, etc., is also derived from the food eaten. The source of the heat and force in the body is the food.

The parts of foods which furnish the substances for body material and for heat and energy are: (1) Protein, (2) fat, (3) carbohydrates, and (4) ash material.

Protein, so far as foods are concerned, is made up of two classes of substances, albuminoids (proteids) and amides. The amides are found in immature plants and are not so valuable as the higher proteids materials. The albuminoids, which occur in grain, roots, and other forms of vegetable foods, are similar in composition to those found in milk, blood, and flesh. They are commonly called the "flesh formers," as they are the only materials in the food which the animal can construct into flesh. They are also the source of such materials as hair, wool, hoof, horn, etc. Further, by the combustion of the albuminoids in the body, heat and mechanical force are developed, and, under some circumstances they are split up with the formation of fat.

The fats found in food are similar in composition to such substances as lard, tallow, etc., which are the common fats formed in the animal body. The fat may be either burnt in the animal system to furnish heat and energy or deposited on the body as fat. As a heat and force producer, fat has a greater value than any other ingredient of the food.

The carbohydrates of the food are chiefly starch, sugars, and celluloses, and form the largest part of vegetable foods. The latter substances form the stiff framework of the stems of plants and the hulls of seeds, and are only partially digested. These carbohydrate bodies are not permantently stored in the animal body, but serve, when burnt in the system, for the production of heat and mechanical work. They are also capable, when consumed in excess of immediate requirements, of conversion into fat.

The ash materials present in the food are the same as those found in the animal body; all that is accomplished by the animal is to select from the digested ash constituents those of which it is in want.

From what has been said, it will be seen that the albuminoids are the only constituents of the food which are capable of being transformed into flesh. They will also produce heat and mechanical work, but fat and carbohydrates, especially the latter, are the cheapest materials for this purpose. To make the most economical use of foods, the albuminoids should be fed in such quantities that they will do the work which they alone can do, and allow the heat of the body and the energy for work to be obtained from the cheaper fat and carboyhydrates. These are the facts which form the basis of the balanced rations and feeding standards; for a balanced ration is simply a statement of the weight of protein needed by the animal of a certain weight to do the work required of it in growing, fattening, or in the production of milk, etc., together with the weight of fat and carbohydrates required to keep up the temperature of the body and do what mechanical work is necessary and leave a residue for the formation of fat, if such is desired. Naturally a young, growing animal will require more protein in its food than one full grown; for it is building up bone and muscles,—both of which require protein. Thus milk, which is the natural food of the young animal, is rich in protein. Again, a cow giving milk requires an abundance of protein, because the feed is the source of the protein of the milk. It is true that a horse, for instance, may do a greater amount of work than the food fed will furnish energy for, or that a cow will give a larger amount of milk than the food will warrant, but this is done at the expense of the reserve of materials stored in the body, and as a result the horse or the cow becomes thinner.

Another point worthy of mention here is that there is always a certain amount of food required to maintain an animal in a condition that it will neither gain nor lose, for energy must be expended in masticating and digesting the food, circulating the blood through the body, etc. If the animal is of a restless, nervous disposition, it will require more food than if it is of a quiet, even disposition. Food must be provided for all these factors before any of it will go to the production of fat or milk, and it is the amount of food that the animal receives over the quantity required for supplying energy for these factors, or over the maintenance diet, as it is spoken of, which affects the gain in body weight or the yield of milk. Consequently, it is evident that there can be no profit in feeding a maintenance diet to a cow giving milk. On the contrary, the aim should be to get the cow to eat a maximum amount of food in order that there may be a large surplus for production. In this way a much smaller proportion of the food goes for maintenance and a larger proportion to production purposes, with a corresponding increase in the profits. Naturally it must follow that the animal which will eat the largest amount of food, and which at the same time is of such a disposition as to require a small amount for maintenance purposes, is the most profitable one.

Composition of Foods.

In the preceding paragraphs we have named the chief constituents of foods and described some of their functions in the animal body. We shall now consider the composition and feeding value of some of the foods, or rather groups of foods in common use.

The feeding value of a food is largely determined by two factors: (1) its composition, (2) its digestibility. The first of these deals with richness of the food in protein, fat, carbohydrates, and ash materials. The second determines the extent to which these various constituents become available in the body. A knowledge of the composition of a food is important if it is to be used intelligently. In the light of previous statements, we naturally consider those foods which contain the largest amounts of the protein and fat and the smaller percentage of crude fibre as the most valuable. The following table gives the percentage amount of the various food constituents present in a number of the most common foods:—

Composition of Cattle Foods.

—	Water.	Crude Protein.	Fat.	Soluble carbohydrates.	Crude Fibre.	Ash.
	%	%	%	%	%	%
Wheat	10.5	11.9	2.1	71.9	1.8	1.5
Oats	11.0	11.8	5.0	59.7	9.5	3.0
Barley	10.9	12.4	1.8	69.9	2.7	1.8
Corn	10.6	10.3	5.0	70.4	2.2	1.5
Peas	14.0	22.5	1.6	53.7	5.4	2.8
Timothy hay	13.2	5.9	2 5	45.0	29.0	4.4
Clover hay	15.3	12.3	3.3	38.1	24.8	6.2
Alfalfa hay	8.4	14.3	2.2	42.7	25.0	7.4
Oat straw	9.2	4.0	2.3	42.4	57.0	5.1
Corn silage	79.1	1.7	0.8	11.1	6.0	1.4
Mangels	90.9	1.4	0.2	5.5	0.9	1.1
Turnips	90.5	1.1	0.2	6.2	1.2	0.8
Wheat middlings	10.1	15.5	3.9	62.5	4.3	3.7
Wheat bran	10.4	15.0	3.8	57.0	8.7	5.1
Cotton seed meal	5.9	44.2	13.6	24.6	4.8	6.9
Linseed meal	9.1	30.4	7.1	36.9	10.6	5.9
Gluten meal	7.1	38.8	3.4	47.6	2.0	1.1
Gluten feed	8.6	25.0	4.6	54.8	5.9	1.1
Brewers' grains	6.6	14.6	6.6	58.1	12.8	1.3
Oat hulls	8.1	2.2	0.9	53.9	28.1	6.8
Dried beet pulp	2.9	8.5	1.1	65.9	15.2	6.4

The valuable forage plants of this country belong mostly to two families, the grasses and the legumes. June grass, red top, timothy, and the cereal grain plants are types of the former; and the clovers, alfalfa, and peas of the latter. The most essential difference between the members of the two families of plants when considered as feeding stuffs is in the larger proportion of the protein in the legumes. For this reason they are very justly regarded as the better foods for growing stock and for general use on dairy farms.

With reference to the composition of all dried fodders and roots, foods that are fed in an immature state, it may be stated that they are liable to considerable variation. We find that the composition depends largely on the stage of maturity at which they are cut and also upon the character of the maturing. In general it may be said that as a plant matures the proportion of water, protein, and ash matter decreases, while the proportion of carbohydrates, especially of fibrous material, increases. As this latter substance is largely indigestible, fodder crops deteriorate towards maturity. Young grass is much richer in albuminoids and contains a smaller proportion of indigestible fibre than older grass, and is, consequently, more nourishing. The same comparison may be made between young clover and that which is allowed to mature for hay. It follows that fodder crops should be cut for hay before they reach maturity, and experimental work and general experience has fully demonstrated that these crops should be cut immediately full bloom is reached. Alfalfa is an exception to this, because it very rapidly becomes fibrous and should be cut in the early blossoming stage to obtain the best results.

Regarding the root crops, it has been found that while fodder crops deteriorate towards maturity, because of the conversion of soluble forms of carbohydrates into the insoluble and indigestible fibre, root crops, such as mangels and potatoes improve, owing to the carbohydrates produced in this case being sugar and starch, both of which are of great feeding value.

The root crops do not contain a very large amount of the valuable food constituents, but when fed along with the dried fodders they probably have a food value much greater than their composition indicates. This is due to the increased succulency which they impart to the ration.

The place of grain in a ration is to increase the proportion of protein and other digestible materials, or in other words, to make the ration more concentrated. It is generally agreed that cows of 1,000 pounds weight need approximately 16 pounds of total nutrients daily. Animals that are thin in flesh, especially when fresh in milk, can consume two or three pounds more to advantage. Of these 16 pounds, approximately 2.5 pounds of protein is necessary in order to enable the cow to produce large and continuous yields of milk. If a cow is fed all hay, she cannot eat enough of the food to obtain the amount of the nutrients mentioned. Thus, suppose a cow should be fed all she can consume of any palatable, dry, coarse fodder, such as good hay, she would have at her disposal the following digestible nutrients, approximately: Protein, 1.4 pounds; fat. 0.4 pounds; carbohydrates, 12.4; total, 14.2. It is clear that such a ration lacks in protein, as well as in total digestible matter. In order to overcome these deficiencies, recourse is had to the concentrated feeds, rich in protein, and sufficient is added to increase the protein to the desired amount. This, in brief, is the function of grains and concentrated by-products in the ration. It is, of course, evident that the cereal grains, as corn, oats, wheat, etc., are not sufficiently rich in protein to very materially increase its proportion in the diet. But these foods are rich in nitrogen-free-extract or carbohydrates, that are easily digested and are very useful when fed along with the coarser foods which contain much fibre.

Pea meal, linseed meal, gluten feed, wheat bran, and middlings are foods rich in protein and are, therefore, most valuable components for a ration intended for dairy cows. On the other hand, it is evident that oat hulls, dried beet pulp, corn bran, and such low grade materials cannot build up the protein side of a ration. They are also entirely unfit to be used as substitutes for linseed meal, gluten meal, gluten feed and such nitrogenous materials.

What has been said serves to draw attention to the point, that when purchasing foods the percentage of protein they contain is of prime importance. The home-grown crops, especially the grasses and cereal grains, are more likely to be deficient in this than in any other constituent, but when clover or alfalfa hay are used as the coarse foods, the use of concentrates, especially rich in protein is not so necessary.

The shortage of coarse foods and grains the last few years has been the means of causing many feeders of live stock, particularly dairymen, to consider the advisability of purchasing certain of these mill by-products for which, heretofore, they have had little or no use. Dairymen, too, are recognizing the fact that in order to secure the best results from their cows, they must feed a ration richer in protein than can, as a rule, be compounded from the grains, hay, and straw raised on the farm. The by-products best adapted to enrich the diet in protein are the residues from the manufacture of some specific product from the seed or grain, as, for example, oil from cotton seed and flax seed, starch and sugar from corn, beer from barley, and flour from wheat, rye, and buckwheat. All these by-products which include cotton seed meal, linseed meal, dried brewers' grains, gluten meal, gluten feeds, and the various kinds of bran, middlings, etc., are very much richer in protein than the original seeds or grains, because the substances extracted from them consists of fat, in the case of the first two, and of starch, or products rich in starch, in the case of the others. Thus proportionately increasing the protein in the residues. For this reason, all of these by-products have been found to serve an excellent purpose in the building up of rations; they are generally palatable and healthful and, if judiciously used, do not contribute any undesirable qualities to the products, beef or milk; besides, they possess the further advantage in that, in many cases, the cost of the ration is reduced by their use. Their intelligent purchase and economical use, however, requires that the purchaser shall possess a definite knowledge of their composition, that is, he should know, first, not only how much protein and fat the genuine products, cotton-seed meal, linseed meal, gluten meal, gluten feed, bran, and middlings contain, but also whether there is reasonable uniformity or wide variation in respect of these compounds in the composition of the products of the same kind or name; secondly, whether any of them are liable to be reduced in value by the addition of cheaper substances.

We have endeavored to collect some definite data regarding the character and composition of these by-products. For this purpose, we gathered a large number of samples and analysed them, the results of which were published in Bulletin No. 138. Since this bulletin was published, we have analysed many more samples, and the results show that a large number of the various products offered for sale are of good quality, but that those of the same kind from different manufacturers vary quite widely in composition. Further, we have found that in some cases there is a tendency to mix residues of one grain with another and sell them under a trade name, or to add low grade by-products to those with which the farmer is familiar, as, for example, oat hulls to wheat bran. With these facts before us, it is evident that the purchaser cannot form a correct idea of the composition or value of a feed from the name given it, and that steps should be taken to have these concentrated feeds sold in such a manner that the percentage composition rather than name will be the guide to their value. Laws have been passed in many of the States of the American Union making it compulsory for the seller of these mill by-products to print on the bag the guaranteed maximum percentage of protein and fat and the minimum percentage of crude fibre, and, also, the

grains from which the feed was made. In this way the farmer knows exactly what he is buying, and if he is familiar with the composition of his own feed stuffs and the requirements of the animals he is feeding, he can purchase his supply of concentrates intelligently and with every assurance that he is getting full value for his money. It will pay the farmer in good hard cash to make a thorough study of the whole subject of cattle feeding and to make themselves familiar with the nature of the various feed stuffs now on the market in order that they may not only feed more economically, but that they may intelligently assist in the procuring of laws similar to those now in operation in the United States, which would make it possible for him to purchase feeds with a guarantee as to the amount they contain of the essential food constituents.

Q.—What is the relative value of linseed meal as compared with old process meal? A.— In the old process meal the fat is removed by means of pressure, and in the new process it is extracted by solvents, and there is a more complete extraction of the fat, so that the new process meal will contain the least of this fat, and will be correspondingly lower in value. There is not a great difference in the price.

Q.—Are any of the dairymen using gluten foods or gluten meal? A.— We can use a certain amount of linseed meal, but there is a limit to the amount you can feed. Cotton seed meal is entirely unsafe to feed to calves or young pigs. It may be used in limited quantities to older animals.

Q.—What amount of linseed meal would you feed to a cow in a day? A.—I would not recommend feeding more than two pounds a day to a cow, and I would not start at that amount. I would start at a lower amount.

Q.—Would it be as valuable as alfalfa? A.—If you have a good quality of alfalfa, it is doubtful whether it is best to handle expensive high price materials. I would rather depend on bran and brewers' grain. When you start to feed cotton-seed cake and linseed cake, you are handling something that is too high in price and it can be wasted unless you are looking after the feed yourself.

Q.—What would you recommend to feed with good ensilage and clover hay? A.—There would not be the same need so far as the effect on the system is concerned to feed bran as there would be some of the other drier foods. I know of good results from the use of oats and bran along with clover hay and ensilage.

Q.—How are we to know how much of this linseed meal we are to put in? A.—Having a table showing composition of the feeds to be used, calculate the number of pounds of protein in the ration and the number of pounds of carbohydrates and the fat, multiply the pound of fat by 2¼, add the product to the pounds of soluble carbohydrates, and divide the sum by the pounds of protein. The result should be about 5, indicating a nutritive ratio of 1 to 5. We should not get far beyond 1 to 5. If we do we decrease the digestibility of the food. I know one case particularly on the farm on which I was brought up. One year we were short of grain in the spring, and we had a lot of potatoes left over and they were worth only 25 cents a bushel ,and we thought we could feed them to the cows. We were not feeding very much grain, and we added this starchy material to the diet of those cows, and from that very day they started to eat it they went back in their milk, not because the potatoes were not good, but because we were feeding too much starchy material, and we decreased the digestibility of the whole of that diet. Therefore, you can see you can get these figures so far apart that you will not get good results.

Good results can be obtained from the use of oats and bran along with clover hay, and if you add timothy hay you can not get enough protein in the food and you will have to introduce something else.

Q.—How about whole flax seed ground? A.—That would not be as high in protein as linseed meal; it is a very rich food and would have to be used with a great deal of discretion.

Q.—Would there be more protein in well matured fodder corn than in corn silage? A.—No, if you let corn go past its maturity you decrease the amount you will get out if it, because you decrease the digestibility of the food.

Q.—How does linseed meal and gluten compare in price at the present time? A.—If you could buy gluten meal true to name then you would pay fully as much for it as you would for linseed meal. But how are you going to know whether it is true to name or not? Gluten meal is the gluten of the corn flour separated and kept by itself, therefore it is very high in protein matter. We analyzed 22 samples of what was called gluten meal and the average per cent. of protein was 24.98. We analyzed 17 samples of gluten feed and the average was 25.65, that is nearly 1 per cent. higher in gluten than it was in gluten meal. The variation in the proportion of the gluten meal was from 15 to 34 per cent. The variation in the percentage in the foods which were being sold as gluten meals was 15 to 34 per cent., over double the amount of protein, and both were selling under the same name and presumably for the same money.

Q.—Do you know which factory you were getting it from? A.—We knew at the time; I have not got the figures now.

Q.—What means would the miller have of knowing he was selling a genuine article? A.—He would know by the way he made it.

Q.—I understood you to say that sometimes the miller sold in ignorance? A.—Not in the nature of the materials in it, he might be making it perfectly honestly according to his idea. Take the case where it varied from 15 to 35 per cent. There must have been some difference in the two meals, and yet they were going on the market under the same name.

Q.—Why is corn silage considered such a great milk producer when it is low in protein? A.—In the first place we get what we have got to have in all foods, we have succulency. You might say, "Why do turnips give such good results when they have such a small protein content? We have succulency, and we have that in grass.

Q.—Is there any difference in the water in those things—I have been told that turnip water is not good water? A.—I guess it is. There is no difference normally in the water in the milk and the water that is added to the milk.

Q.—Would gluten meal make butter oily? A.—There might be something in that. We find these foods all have their influence on the consistency of the fats; it is a corn oil, a soft oil, and it might have some effect on the butter.

Q.—What would you consider a balanced ration for a herd of cows in full flow of milk? A.—I think where a man has clover hay in abundance that he might make a very fair diet for his stock out of the use of that clover hay along with bran and oats mixed in equal quantities and feed it at the rate of 8 to 10 pounds a day, according to the size of the animal. If the clover hay is not up to quality he might add a little gluten meal or linseed meal or some of the concentrates. If the hay has timothy in it I would add a pound or so per day of linseed meal. If ensilage is introduced there is not the same need for bran, but it does need something in the way of protein.

Q.—Would it pay a farmer to give $20 a ton for bran if he had plenty of roots? A.—I think it would pay him to buy some bran; even pea meal would come in very well, because if he is using a lot of roots he does not need to use so much bran. I think that for milking cows we should feed some of these concentrated materials to keep up the protein side of the diet.

Q.—Supposing a man has a sample of gluten meal or linseed meal and he has it analyzed, would he be pretty sure to get the same analysis from those meals afterwards in purchasing them in quantities? A.—I presume a sample taken out of the ordinary run would be as they usually make it. We are going to analyse a number of samples that are sent in. We have had about 20 samples sent in since the beginning of the year. We cannot promise that we can send a report by return mail, but we will get it as soon as we can.

Q.—What variety of wheat bran gives the most protein? A.—Spring wheat is richer in protein than fall wheat. I think that for dairymen there is no better roughage crop can be grown than alfalfa; you get a big yield and it is very rich.

Q.—Can it be used in the silos? A.—I do not think it can be cured there to the very best advantage.

Q.—Is there more than one kind of alfalfa? A.—Yes, I believe there are a great many kinds. I cannot recommend which is the best. (Applause.)

ADDRESS OF WELCOME.

The Mayor of Brantford was introduced, and cordially welcomed the Convention to the city. He then proceeded to say: Looking over the records this afternoon, I discovered that yours is a very old industry. You date back, at all events, as far as King Solomon, the wisest man, who said, "That the churning of milk brings forth butter." So that he had in his day at all events discovered that much, and he thought it worth while to give it a place amongst the many other wise things he said. And going back farther than that, we discover what a large and important place the dairy products of the olden time had in society, for we read that Jesse said to David, "Carry these ten loaves to thy brethren and these ten cheese to the captains of the army." (Applause.) Going back even farther, we discover that Abraham entertained the angels with milk and butter.

We see then that your industry is one of the very oldest, and the dairy products in the olden times, ranked amongst the most important as they do to-day, and I congratulate you and the Dairymen's Association of Western Ontario upon the high position you have taken in this regard and upon the very great prosperity which you have attained as an Association. It is a great thing for our industries to find a home alongside of old established industries having a connection all over Canada. It is fitting that this Association representing the most important branch of agriculture should come to a city like Brantford. If we are going to build up this heritage that God has given us on this continent, we must not be jealous of each other, but we must stand knee to knee, hand to hand, and shoulder and shoulder if we are going to make the most of this Canada of ours.

Mr. Cook, President of the Board of Trade, Brantford: It affords me peculiar pleasure on behalf of the Brantford Board of Trade to welcome to our city this very important Convention. The Board of Trade is, as you know, composed of manufacturers and business men. That being the case

we felt very friendly towards this Convention, because you are all manufacturers and you are all business men. We welcome you to this city for many reasons, but especially because of the great business you represent.

When I tell you that the dairy productions of the Dominion of Canada for 1908 amounted to $94,000,000, one can see at once that the dairy business is of the greatest importance to this country. As your President told you this afternoon, the export of dairy produce has not been quite up to the mark of former years. I notice that the export of cheese and butter for the last fiscal year comes to about $24,000,000. That is something you should be proud of, although in former years the figures were higher than that; but it must be remembered that the home consumption is increasing, and although the exports are decreasing a little, I am sure the actual manufacture of dairy products is on the increase. I would like to encourage you to go forward. This country in its agricultural capacity is able to supply the whole world, but certainly the British Isles, with pretty near all the dariy product they need That time has not yet arrived but it is coming. We welcome you because of the Association itself; the Dairy Association, by careful investigation has greatly improved the outlook of your condition. When the Scottish Farmers' Commission was here, one gentleman spoke of the discouragements of the dairy condition as they had it in Scotland. Some of these discouragements were the restrictions, the severe law regulating dairying, and he said we simply have to overcome these things by stricter attention to our own business. We have to adopt methods to increase the flow of milk, to see that our premises are scrupulously clean, so that we can obtain a greater supply and a better product and then the people are bound to have it. We welcome you all, because of your industry.

I read long ago that people made a golden calf and worshipped it, now I think I see here some of these descendants who are worshipping it here to-day. In the Province of Quebec there are 2,800 cheese and butter factories; in the Province of Ontario, 1,264 and in all other parts of Canada, 250. There are 4,300 factories distributed all over this country. We are destined to be a great country. We have a great clay belt in New Ontario with millions of acres largely adapted to dairying, and well designed to carry on this business in the northern part of this Province.

The crops of the Northwest alone, for 1908 were 232,000,000 bushels. Eight years previous they were only 32,0000,000 and we are going to increase more rapidly in the future than we have in the past; so that you can understand you farmers are engaged in the greatest industry in the world. The agricultural industry is the greatest, the most important, and by far the best industry of the Dominion of Canada, because it is the foundation of all. It is the true industry, because the wealth you create is created out of the soil and that, as you know, is the true wealth; that which comes from the soil, the forest, the mines and the fisheries.

AGRICULTURAL PROGRESS.

By G. C. Creelman, President, O.A.C., Guelph.

It is always a pleasure for the officers of the Ontario Agricultural College to attend meetings of the Ontario Dairymen's Association, both East and West, and to be able to tell you some of the things that we are trying to do in the interests of the farmers at the Ontario Agricultural College. This business of farming is so different in this country to what it is in the older

lands, particularly on the Continent of Europe and the islands of England, Ireland, and Scotland. The Government has seen fit to establish the Agricultural College and Experimental Farm, and there seems to be the necessity year after year to go into experiments and work out new thoughts and new ideas, and try to see whether we have been making a mistake in the years gone by, and to work up to something bigger, better and broader in the future; and it is some of these things that we are doing day after day, that I want to tell you something about to-night. It was my privilege during the past season to go to the old country for the first time to look into some of the farm problems there, and see how they compared with ours.

In the first place there seems to be a dignity in the calling of agriculture there to which we have not attained. I had a letter from the Hon. Mr. Dryden to the herdsmen who had charge of the Queen's farm, and who now has charge of the King's farm at Windsor. It was my privilege to send the letter to Mr. Tait, and he requested me to go out the next morning. I noticed by the papers that the President of France, who was visiting England for the first time in his life, was visiting the King, and he was going to take him to the farm at Windsor that very morning, so thinking that would be a little too much for one day, that they could not stand so many celebrities, I dropped Mr. Tait a line stating that he said Wednesday, and wanted to know if it was a mistake. He said "No, that while every thing at Windsor was officially closed for a few days, he thought it quite the proper thing for a Canadian to come to his house, and that I might see the King and President on the farm." And would you believe me, that when the King and President of France drove up on the farm, they got out and had the cattle brought out of their stalls, the dairy cattle and the beef cattle, and they walked up to them and put their hands on individual animals, and the King by word of mouth pointed out to the President of France, as far as we could tell, and as far as Mr. Tait told us afterwards, in good live stock language, the best points of the different individual animals he was exhibiting. (Applause.) I have to say to you that if the business is not too small for the King of England, and if he considers it of such importance as to spend half a day with the President of France to show him the live stock and the dairy—and he took him to the dairy as well and showed him the milk and cheese and butter—if that business were not too small for the King of England, then you should, I think, never be ashamed of it and should never hold down your heads and say, "We are only farmers." (Applause.) Perhaps there has been too much in this country of that kind of talk. When men were at work with their hands in clearing up the country, it was not easy clearing the hardwood bush, for it was not easy to cut down, and it was not easy to get out the stumps and drain the land and get it into the splendid condition it is in at the present time; and for that reason they could not do this hard manual labor and appear like gentlemen, no matter what they were at heart. But I hope that day of judging a man by his clothes or occupation, no matter what it may be, has gone by, so long as it is honorable and that we will all work for the upbuilding of the Dominion of Canada. I believe the day has gone by when the farmer or any other artisan will be looked down upon, simply because he is doing his work. Farmers are coming to us at the Experimental Farm in increasing numbers. Every year between thirty and forty thousand come in the summer to look over the place and see how they like it and gain pointers and criticise our work. They take lunch, all of them. (Laughter.) They give us the benefit of their experience, and get the benefit of ours and go back home with a broader outlook and a better knowledge of certain things. Then as we have the privilege of going into Agricultural Societies and other societies in this Province. We meet them upon their own ground, and as we

discuss these matters. We find some points of difference between the people on the farm and the people living in the towns and cities, and knowing thy are all one blood and that nine-tenths of the people of the city start from the farm, we wonder why they sometimes differ, and do not understand each other. The city men forget that the farmer does not handle much money. His is a business of handling produce, and he has very little money to spend. His home is a place, and I hope always will be a place, where the city man can sit down and get a good square meal or two or three or stay a week, put his horse up and be fed hay and oats and no questions asked, but you are welcome to stay as long as you will. (Applause.)

I have seen men come into our house to discuss church questions with my father, and they talked with him very carefully about Mr. So-and-So only giving $5 when he ought to be giving $10; that he seemed to be a very generous sort of fellow; but they could not get $10 to save their lives. Another man would speak up and say, "I know John Smith, and you just get up a tea-meeting, and if he doesn't bring in a sleigh-load, and if his women folks do not cook for three or four days and use up all the pastry and flour in the house and use up everything to make pies and cakes, it is a wonder to me. They will bring in $20 worth of stuff if necessary and think nothing of it at all."

In the city homes you are not always prepared when four or five friends come in for supper. When you come in to see the banker or lawyer, does he ever say to you, just sit down till half past twelve and we will all go up to the house and have dinner. (Laughter.) Did the banker ever ask you that? I know he did not; if he did you would drop dead. (Applause.) He is handling large sums of money and making large sums of money, and would not think anything of asking you to go to the hotel and have dinner and he would not object to paying $1.50 for it, because he is handling money and not produce. So you must not say that the farmer is a stingy man and the city man is generous, but rather, they are both generous people but they are dealing in different things.

I am pleased to see the President of the Board of Trade here. I do not know that the Board of Trade are in a position to do just what I would like them to do, but I think many of the Boards of Trade in the smaller towns might reach out and take some of the farmers into their confidence, and especially creameries, cheese factories and canning factories, and get the bankers to co-operate with them. Make it just as convenient for the farmer to organize and bring the farm produce into the towns, because I think this would be better business than bonusing shoe factories and mills. I believe if there was closer co-operation it would be better for both parties. I am pleased that the city of Brantford and town of Orillia, through their Boards, are doing things of this kind, and inviting people to come to the Board of Trade meetings and speak on agriculture, and I believe it would be for the benefit of all.

Three years ago we began to get, not for the first time, but in increasingly large numbers, letters from many farmers throughout Ontario, stating: "We have cleared up our farms. We have removed all the stumps, and we have removed the stones and got our entire farm under cultivation, and yet we have certain fields that are low-lying and that are not giving any better returns than they gave to our father forty years ago, and we want to know if it would pay to tile drain these fields." We asked the Government for assistance to send out men so that it would not cost the farmers anything but the actual expense of that man travelling from the College to his farm and his board while there, so that he could survey the fields and

give the farmer a drawing of every field, and tell him the quantity of tile required and give him a working plan of how to go about it and drain the fields; and this has become so beneficial that we have asked for an increased grant so that we can have four men in the field at one time. One man from Victoria County writes, "I had a field in which my father before me and I for the last twelve years have not been able to plant until my neighbors and myself had finished all our other fields. It was damp and low, and needed draining, and I either had to leave it in hay and take a chance on the crop or pasture it. You sent your man to us and we drained that field at an expense of $14 per acre. It is now six weeks earlier in the spring, it will grow any crop that will grow anywhere else in the neighborhood, and in three years we have, by the increased earnings of that field alone, paid for the tiling of it." Adding together all the low spots and swamps in Ontario, there are hundreds of thousands of acres that might be cropped, and you know the swamp land drained contains the best soil and would be worth a great deal of money.

Mr. James, the Deputy Minister, discovered from the statistics a few years ago that the potato crop was falling off in this Province of Ontario, until at the present time we are actually importing potatoes into the Province, and at one time we exported them. Toronto takes from two thousand to three thousand bags of potatoes every day, and when I say to you that a large percentage come all the way from the Province of New Brunswick, you will begin to realize something is wrong. Mr. James sent men throughout the Province to find out the trouble, and he found that the difficulties were two-fold. One was that the blight had been so prevalent that the farmers had given up growing potatoes, and the other was that there were so many different kinds and varieties grown, over ninety different sorts being planted, that in many instances they could only be used for home consumption because you could not get enough of any one kind to ship to a commission agent. The principal reason seems to be the blight. That young man discovered that in some places they were not subject to blight, and he learned that there were in the Province of Ontario some varieties that were almost blight proof. He found that sixty-four per cent. of all the varieties were strictly subject to blight, and thirty-six per cent. were blight proof, and the Department is introducing these facts, which ought to increase the growth of potatoes. Through the Experimental Union, which was started at the College and has grown out from it, we now have four thousand five hundred farmers growing varieties of crops upon their places from seed which is sent to them by us every year, and they report back to us in the fall as to how they develop, the actual weights in grain and straw, etc., and by this means we get an idea of what can be done in the different parts of the Province. We plant small seed in one plot, and larger seeds in another, and then watch the results. There was a difference in favor of the large seed of nineteen per cent., and the difference in plump *versus* shrunken seed of twenty per cent., and yet it is pretty hard to get it into the heads of some farmers that it would be money well saved if he would in the early spring or in the winter, separate the seeds and plant only the large plump seed, knowing that it would benefit their business to the extent of twenty per cent. We have fallen down during all these years by working by rule of thumb, and by not knowing these little tricks of the manufacturing trade—knowing only how to work hard, work honestly, and intelligently, and overlooking some of these small things which made the difference between the profit and loss. We have discovered after a number of years trial that by planting spring wheat, oats and barley and peas, in the order named, one week apart in the spring we get an average of forty bushels per acre, and

by planting spring wheat, barley, oats and peas, in the order named, we get but thirty-five bushels to the acre. If that one item alone were known throughout the country, and if all the farmers planted in the second order instead of the first, it would make a difference in the Province of Ontario alone of 55,362,309 bushels every year, or nearly as much as is produced of wheat in the Province of Manitoba alone. By taking samples of the best kinds of oats and peas and planting them here and there throughout the Province in an experimental way, and finding out what is the best and advocating that and giving that information to Mr. Putnam and the workers, in Farmer's Institute meetings, we are now producing an average of 19 bushels per acre more than ten years ago. There has been produced in this Province more than one hundred million bushels of oats, and if we put that increase at 20, to make it even, at an average price of 40 cents a bushel you have a very large annual increase, and thus has been brought about by the work of the Experimental Union and Dominion Experimental Farms and other educational agencies an increase in the oat crop of $8,000,000.00.

One of the great problems we have to solve in this country, and one that the Scotch Commissioners referred to, is that we do not seem to be husbanding the fertility of our farms. We seem to be perfectly satisfied to get crop after crop, and return the amount of fertility we have, but never study as to the exact number of animals we ought to keep on every farm to keep the farms up to their best possible state. The Scotch Commissioners said they were shocked at the statistics, both in this country and the United States. While old England gives an average of over 30 bushels to the acre, Ontario has fallen down to 20 bushels, and the States of the Union have only an average production of 12 bushels. They stated that they could hardly understand that in a new country, well watered, with plenty of nitrogen, potash, and phosphoric acid, we are not keeping up the fertility of the soil. We have been trying to induce our farmers to grow clover crops and vetches, lupines, beans and peas, crops that take the free nitrogen from the air and deposit them in the soil. We have found that many soils in this Province would not produce clover. During recent years agricultural science has discovered that there is a bacterial growth in the roots of clover, and we find that we can take that bacterial growth and take them to the laboratory and breed millions of them, and then put them in little bottles and send them out to the farmers, who can mix them with water and sprinkle all the seed before introducing to the soil, and that will make the clover grow. It sounds like a fairy tale, and yet it is being done every day. We have sent out hundreds of these bottles. These are some of the things we are trying to do, and we want to do more. You want a doctor in your neighborhood, and you well know the necessity for lawyers; yet we have never thought it necessary in this basic business of Agriculture to have somebody to send to look after your land when it is sick—somebody to give you advice just when you have need of it. We hope to have a graduate of the Agricultural College in every county in the Province, who will be able to give the farmers the information they want for the up-building of this greatest of all industries, Agriculture. (Applause.)

Mr. Brewster, M.P.P.: I am sure it is with a great deal of pleasure that I am here to-night to say a word to this Convention of Dairymen. I was very much pleased with the address we have just listened to from Mr. Creelman. I am sure the Province is to be congratulated on having a man like Mr. Creelman at the head of our Agricultural College. You have heard words of welcome from Mr. Cook and the Mayor on behalf of the city, and I would like to welcome you on behalf of this county for the farmers of

Brant. We have in this county as progressive farmers and dairymen as can be found in any part of the Province of Ontario. About fifty per cent. of the people of this Dominion are engaged in agriculture, and there are about two billions of money invested in agriculture in the Dominon of Canada. The annual produce of the farmers of the Dominion is over three hundred million dollars, and I find the dairymen are doing more than any other people to make the Province of Ontario great. You have exported to Great Britain some twenty-four million dollars' worth of cheese and about four million dollars' worth of butter, and the city of Brantford and the county of Brant cannot extend too hearty a welcome to the members of this Association. The agriculturists of this Province have four times as much invested as have all other manufacturers of the Dominion of Canada, and your meeting here in the city of Brantford will promote a feeling of greater friendliness between the manufacturers and agriculturists of this Province.

Sir John Macdonald used to say he was a working man, and so when anybody asked him what he made he said "I am a cabinet maker," and in that sense I am a manufacturer. If the manufacturers will make the best goods, and if the dairymen will make the best butter and cheese, and if the legislators will make the very best laws, then all three together will combine to make this old Province of Ontario great. (Applause.) We hear too little of our Province, and too much of the great Northwest. We have in Ontario a Province as great in extent as France and Germany. We have in this Province a greater extent of territory than the United Kingdom of Great Britain and Ireland. We have a Province blessed with the best climate the world has ever known. On the south we are as far south as sunny Italy, and we go north as far as the frozen north. We have a great rainfall, and drouth is unknown. To the north we have a great clay belt of sixteen million acres, and I see no reason why our people should leave this Province and go to any other Province of the Dominion to help build it up. Wherever I am, I intend to raise my voice on behalf of the Province, and I ask you as agriculturists to stand by your own Province, be loyal to it. Remain here and encourage your sons to remain here and help build up Ontario. (Applause.) Do not be satisfied with what you have done in the past, your motto ought to be "Excelsior." Your aim and ambition ought to be to make the very best butter and cheese that the world can produce. You have the greatest market in the world in Great Britain, and in that respect your motto ought to be "What we have we'll hold." Do not be ashamed of your profession. You have one of the noblest. Nobody is more independent than the farmers. Why is it that boys leave the farm? Because their parents point to the man in the city, and say, "There is a man that does not have to work hard; go to the city and have an easy life." Do not have any more of that talk in the future. I hope that you will have greater success than you have had in the past. We welcome you here to Brantford, and we trust that you will continue your good work, and that this Association will prosper. (Applause.)

ADDRESS.

By C. C. James, Deputy Minister of Agriculture, Toronto.

I felt as I listened to the speech delivered by Prof. Creelman that perhaps, after all, I must be getting pretty old, when one who had formerly been a student under my care could get up and deliver an address such as

you have listened to to-night. And then when Mr. Brewster came on, who was a fellow student of mine some 25 or 26 years ago, I said, "There is no doubt about it at all." (Laughter.) And yet I think I take a little more pleasure in coming back to the Dairymen's Convention each year. There must be something in this new method of schooling that attracts the older people. It brings out the grey haired old men year after year. What does this Convention mean? What have you come out for? You have not come here for pleasure or entertainment, because goodness knows you can get better entertainment elsewhere. You come here to learn how to make more money. Has not that been the motive that has influenced the majority of you in coming to this Convention? You have said, "If I go to this Convention there is a probability that I will learn something that will help me to make more money next year." And after all that is what we are after, whether we are doctors, lawyers, manufacturers, or dairymen. That is the one thing that brings us together in connection with these Conventions. Are you learning in connection with these Conventions how to make more money? It will altogether depend upon yourself. Why do not we make more money out of the business? Simply because we do not always take home and apply to our work all the principles that are taught us at these Conventions. They are making wonderful progress in the Western Provinces, and we are glad to know it, because it means a better home market for the people in this country, for certain things that we can produce here they cannot produce in the West. We are not standing still in this Province by any means, although judging by some of the articles in the papers one might think that the prosperity of this country depended on the wheat crop of the West. I have seen in the last two or three weeks editorials forecasting good times, simply because the Western Provinces produced so many bushels of wheat, oats, and barley. Well, we produced here in the Province of Ontario, last year, as much again as all these three Provinces put together (applause), and we intend to increase and grow still more, and we would be very foolish to sit down and allow these young Provinces to get the start of us. We have in the Province of Ontario possibilities of a more varied nature than any Province in the Dominion or any State in the Union. We can grow live stock and produce dairy products, and fruit and grain and vegetables, and there is no other similar section on the continent of America where you will have all these varied lines of agriculture equally developed. Of course we cannot grow wheat with the Prairie Provinces, but they cannot produce live stock such as we can. We cannot produce a few of the fruits of California, but we can produce fruits that California cannot produce. Go over the continent from east to west and north to south and you cannot find any part of it that will compare with this old Province of Ontario in natural resources. (Applause.) I have relieved my mind of that. Ontario is all right. (Loud applause.) We are chasing the almighty dollar. It is pretty hard for a man who has not the price of a meal in his pocket to be moral. It is pretty hard for a man who has not the price of a meal in his pocket to sit down and enjoy reading the newspaper. It is pretty hard for a man who has not the price of a meal in his pocket to take any enjoyment out of life at all. That is the prime necessity. Let us make as much money in Ontario as we possibly can. That means more butter and more cheese, better butter and better cheese. You say, that is an easy matter. Let some man tell us how we can make that finished article. Better cheese cannot be made without good milk, and you cannot make more of it unless you have more milk. Where do you get the milk? That brings you to the next step, more cows, and better cows. Mr. Whitley knows more about the question of testing cows

than, I suppose any other man in Canada, and that is the reason you had him here; and I hope you will take home, and that you will put into practice, what he is trying to teach to you along the line of more cows and better cows. The cow does not produce milk out of the air. The most interesting book I ever read was one published two or three years ago called "The Fat of the Land," and I would advise you to get hold of that book and read it. The author of that book simply sets the old cow up in front of him as a machine, and he says that machine has to produce as much as possible. The more she will eat the more she will produce, and that brings us to the question of food, more food, and better food. Where are you going to get that? From the land. How are you going to get that from the land? Bring into operation those portions of your farm which are now lying idle, underdrain them, give them better cultivation and a proper system of rotation, and adopt the system of planting only the best seed. You must work intelligently and thoroughly from the ground up.

After all this dairying is not such a simple question. It is a process of manufacturing that cannot be equalled by the highest quality of manufacturing carried on in any factory in the city of Brantford—producing food out of the air, and producing milk from the cow. It takes far more skill to turn these products of air, water, and soil into finished butter and cheese than it does to carry on the most intricate manufacturing process that is carried on in the city of Brantford. If you are not making a success of it, it is because you are not studying some one of these important points. You are perhaps being careful on one point, and neglecting another. If we could only get all the dairymen to put their farms in first-class condition, and if we could get them to get rid of these old cows that are simply pensioners upon the farms, and give the good cows a fair chance by liberal feeding and handling, and being properly milked, and if we would equip our factories in the very best condition, we would get more of these almighty dollars, and instead of producing thirty-five millions of dollars of products, we would be turning out forty, fifty, or sixty millions of dollars' worth. There is no limit to it. It would be a great thing for the city of Brantford if we should bring four or five million dollars every year into this city and put it into the pockets of the manufacturers; because there would be a lot of people in Brantford who would have money to spend and the farmers would perhaps ultimately get their share of it. It would take a long time to get it distributed about the country; but suppose we take this five million dollars and put $100 into each farmer's pocket, what would be the result? What have the bankers been telling us in their annual reports? Why, that good times are coming again to Canada, because the farmers have had a good year. That is what they are staking their future on. They are not saying we are going to have good times in this country because half a dozen men have made a million dollars up in Cobalt. That would not make any country prosperous. But if you took a few millions and distributed it equally into the pockets of the farmers, good times will come like a flash. Why? Because the farmers are not going to keep it. They are going to hitch up their horses and then go into town to do some shopping. They are going into the bank to pay that little note; and if they haven't a note to pay they will go to the grocer's and buy some groceries and to the dry goods store to get a new dress for the wife, first of all; and then of course he will get a new suit for himself, and before you know what has happened, that $100 is out of the farmer's pocket and got into circulation and good times have come. The key to it is not the money, but the man. And when I look into the faces of the men here I say there is hope for the dairy business

because you have it in your faces. I venture to say that ten years from now fifteen or twenty per cent. of you will not be living. There are men in this Convention who were not here ten years ago. You are coming and going to school at a late age; you are geting up pretty well in years, and it is hard for you to learn because you have fixed habits. Where are the boys? There are a few here, and they will not forget the things they hear. If you have come to this Convention and left your boy at home, just go back and tell him, "I am sorry I didn't take you down to this Convention; you ought to have gone there in place of me, and I might better have stayed at home." Do you wonder, after all, why some of these boys should begin to think they had better leave the farm and go to town, if they do not get a chance to come to these Conventions, and are not taken on the summer trip to the Agricultural College? The boys at home are the ones we want to get hold of, because, if we can get them drawn into this agricultural work and start them off in the right way, ten, fifteen or twenty years from now they will be standing on this platform talking dairying as the dairy experts of the farmers of that day. Do not forget the boys at home upon the farm. Why do you men come to this Convention without your wives? You come away to have a good time, perhaps. (Laughter.) Do you mean to say you are carrying on your farm work without the co-operation of your wives and daughters? Are you the whole thing in agriculture? Is not your wife, after all, of a little more importance upon the farm than you are? Be honest with yourself, and turn that over in your mind. If we can get your wives and daughters stirred up on this dairy question you simply won't be untidy, you will simply have to do what you are told. (Applause.) The city man's wife does not want him to talk shop at home. She says, "Goodness gracious, leave your business at the office; let us talk about something else." And the city man's wife very seldom goes to the factory. Where is the headquarters of the farm? It is right inside the home. The woman is on the spot all the time, and if you don't get her interested in this work things are going to go awry. We have organized Women's Institutes, and they have beaten the Farmers' Institutes all hollow. So the life of the farmers' wives in this Province is being improved. The women come to the meetings at Guelph with their note books and pencils, taking down whatever is said, and they are working for the development of the useful side of farm life. We are trying to get away from farm isolation and trying to throw something into the life of the farmer besides mere money making. The men of means in the city of Toronto are going out north, east and west and buying farms where they can go in the summer time and live next to nature. What is the use of going through this world at all unless we get enjoyment out of it? I hope that as a result of this Convention the members of the Western Dairymen's Association will take home with them, not only the few principles we have tried to lay before you, but that you will take home with you a spirit of determination which will give you more pleasure in your work, and that you will get more out of living than you have in the past.

THE BAD AND GOOD IN DAIRYING.

By Miss Laura Rose, Guelph.

(Illustrated by Lantern Slides.)

It is always a pleasure for me to attend a Dairying Convention. I feel I am with my friends—people interested in a like industry to myself—and from whom I gain fresh inspiration for my work.

In presenting this illustrated talk, I have one regret to make. It is said that all we do serves us some good turn in life, and I am sorry to-night that I have not had more personal experience in talking in the dark. (Laughter.) I found that in searching for photographs suitable for slides, it was easier to get those representing the good than the bad, and so in my series of pictures the good predominates, and this is as it should be in dairying.

There is nothing like making a good beginning, so I take pleasure in introducing to you "Boutsje Pieterje de Kol," the best cow in Canada. She is a Holstein in the College herd, and gave in 1907, 20,778 pounds of milk, which if sold at 4c. per quart would have made a profit over the cost of feed of $259.54. Not failure, but low aim is crime, and the farmer sins in that he seems not to have an ideal higher than a cow which will give but three or four thousand pounds of milk a year.

This fine Aryrshire is also of the College herd. Instead of "Dainty 2nd," I would have liked to have shown you "Denty 10th," whose record for September was 1,301 pounds of milk of 5.6% butter fat, equal to 85 pounds of butter, or nearly three pounds a day.

Through the courtesy of B. H. Bull, I am able to let you see his imported Jersey, "Primrose," which won first place at our large shows this fall.

This beautiful Guernsey is of the famous A. G. Lewis' herd, of Geneva, N. Y.

You will have noticed in all these fine specimens of the dairy breeds, the indications which bespeak constitution, appetite and heavy milk flow.

The good cow should have a good barn and yard. By contrast we can see the advantages of proper housing. Here we have a clean, well drained yard, modern buildings, and large silo. Look for a minute at this old dilapidated barn—the hay hanging from the rafters, the rigid stanchion, the whole place having a look of neglect. The one great essential in a cow stable is light; above all else I emphasize its importance. Darkness tends to *dirt*, *dampness*, and *disease*. *Sunshine* speaks of health, cleanliness, contentment. The motto over every stable should be, "Let there be light."

This picture brings to mind the oft asked question, "Does it hurt to let the calf be with its mother?" Yes it does. The cow has the maternal instinct in her just like all mothers. She gets fond of her baby, and will fret over its removal if left with her for only a few days. The calf is not an exhaustive milker, and does not tend toward making the cow produce her largest flow of milk.

This little lad is apparently enjoying milking. Still, it is an unwise practice to allow small children or weak handed women to milk good cows. They have not strength enough to excite the nerves, so that the last process in the secretion of milk may take place. Many good cows are spoiled by being indifferently milked.

I was asked once at a meeting how a cow should be milked. I replied, "Always by a man." I believe, however, I have changed my opinion along this line just a little; at least I am weakening. The more I study and come into contact with the dairy business, it seems to me the more I see the need of women being interested in it. I think the industry has suffered by the women leaving the milking stool. A woman naturally has a higher ideal of cleanliness and more patience and gentleness than a man. These qualities are all needed in the stable. Lest I be misunderstood, I still think the most of the milking should be done by men, but it should be done properly.

Many follow the practice of milking the first stream of milk from the teat into the milk pail. This should not be done. While the cow is lying down on the stable floor, which is often far from clean, bacteria of the worst sort find their way through the small opening in the teat as here shown in this cut of a portion of the udder. In the milk in the canal of the teat germs find ideal conditions to thrive and multiply. These first few streams may cause serious trouble. Give them to the barn kitty, for while harmful to the milk supply, they will not kill the cat. A glance at these two plates made from the fore and middle milk shows the enormous number of germs in the former and the few in the latter.

Another means of producing clean milk is to curry the cows. These animals appear to be enjoying their grooming—and why not clean off a cow as well as a horse? It makes them healthier, and they do better on the same amount of food. Much dirt finds its way into the milk pail during the process of milking, falling from the udder and flanks. To wipe the udder and flanks with a damp cloth arrests the dust, and makes a marvellous difference in the bacterial content of the milk, as shown by the following slides. A few hairs alone can do considerable damage, if they be as dirty as this cow's hair.

Many people have every condition good but the atmosphere. I would far rather have clean air than a clean stable floor. The milk has to pass directly through the former, but does not touch the latter. To sweep during milking, or bring in hay, or clean out the stable is a bad, yes, a *very bad* practice. It makes the air just as dirty as can be, and the streams of milk create a current and carry down into the milk pail millions of particles of dust laden with bacteria. This is the great reason it is hard to get good milk in winter—the stable air is foul.

With the clean atmosphere should go the clean milker. I am too sensible a woman to ask that all should dress in white suits similar to this man; but washable clothes should be worn, and they should be kept reasonably clean.

Lately there has been much agitation over the proper kind of milking pail to use. Certainly this wide flaring one exposes a very large surface of milk to catch dust, etc., while this Freeman pail, with its small hooded opening, minimizes the danger.

The invention which has made dairying more of an industry, and has revolutionized the handling of milk, has been the introduction of the cream separator. But the separator is not an unmixed blessing. In fact I firmly believe many are not producing as good a quality of cream or butter from the separator as they did from the deep can. This is not the fault of the separator, but due to ignorance or carelessness. In the first place the separator is in many cases not properly washed. Just lately when I was advocating the necessity of washing the machine after each time of using, a man in

the audience shook his head at me. I said "You may shake your head if you like, but all the same it must be done." The badly washed bowl or pan is only a breeding place for germ life.

A little sterilized water was put into such a can, rinsed around, and the following slide revealed the countless throngs of germs. One fancies he sees minature tadpoles, lizards, snakes, and fishes, so bad is the condition revealed. All tinware must be well washed and scalded if we wish for good results.

Another detrimental practice is the lack of cooling the cream after it is separated. This accounts for many of the bad flavors and odors found in cream and butter. We must urge our patrons to quickly and thoroughly cool the cream if we wish a choice finished product. To set it in the shed or out of doors even on a cold day does not do. It must be set in cold water and frequently stirred.

Pasteurization is a great boon to the butter maker, giving him a clean seed bed in his cream, in which, by using a pure culture, he may develop the flavor he desires. These plates show up splendidly the effectiveness of pasteurization, no germs present, while the plates from raw milk abound with life.

It is well to keep before the public eye the necessity of a careful watch of the water supply. The surface surroundings may be apparently clean and tidy, but they may be the whited sepulchre. Teepage from the stable and pig-pen often finds its way to the well. This water is used in the dairy, and contaminates the milk, causing in some cases outbreaks of fever and other sickness.

This dash churn is a relic of the past, but pleasant are its memories; while the barrel churn speaks of the present. I will let my audience judge for themselves whether the next picture represents the good or bad in dairying. For my own part I think it looks pretty nice (laughter), and who blames them that the butter does not come. (This slide represents love-making, and the churning neglected.)

Here we have a glimpse of a class of Macdonald young ladies getting a lesson in the O.A.C. farm dairy, where we endeavor to point out the bad and teach the good.

We began with the best cow in Canada, and now will show what is hoped to prove the best cow in the world, "Pontiac Rag Apple," a pure-bred Holstein, who as a two year old gave 18,252 pounds of milk of 4.22 per cent. fat, and who was sold for $8,000.

How beautiful it this pastoral scene—the fine cattle, the good pasture, the grateful shade, an environment of the best, and from which the best may be expected.

The most precious thing in all the world is the dear baby in our home. Think of this happy little chap sucking his bottle which perchance is filled with milk, milked from a dirty cow in a dirty stable, by a dirty man. I plead for the babies that we give them clean milk. Let us banish the bad, and achieve the good in this great dairy industry.

NOMINATING COMMITTEE.

The following were then appointed as a Nominating Committee: Wm. Bothwell, Arthur Gracey, Robert Myrick, Harry White, George Cousins.

REPORT OF COMPETITIONS OF CHEESE AND BUTTER.

Prize List.

	Total score.
September White Cheese:	
1st Prize.—John Cuthbertson, Sebringville	95.32
2nd Prize.—Mary Morrison, Newry	95.15
3rd Prize.—G. R. Stone, Curries	94.98
4th Prize.—A. W. Darroch, Zenda	94.82
September Colored Cheese:	
1st Prize.—J. T. Donnelly, Union	95.82
2nd Prize.—C. Donnelly, Scottsville	95.32
3rd Prize.—Mary Morrison, Newry	95.15
4th Prize.—Harry Donnelly, Union	94.50
October White Cheese:	
Tie for 1st and 2nd Prize.—J. T. Donnelly, Union	94.82
Mary Morrison, Newry	94.82
Tie for 3rd and 4th Prize.—Jos. Skelton, Thorndale	94.49
C. A. Barber, Hickson	94.49
October Colored Cheese:	
1st Prize.—J. E. Stedelbauer, Listowel	94.99
2nd Prize.—J. B. Doan, Birnam	94.16
Tie for 3rd Prize.—W. J. Goodwin, Ripley	94.15
C. Donnelly, Scottsville	94.15
56-lb. Box Creamery Butter:	
1st Prize.—Jno. Cuthbertson, Sebringville	94.96
2nd Prize.—R. Johnston, Bright	94.65
3rd Prize.—A. G. Patterson, St. Thomas	94.
Tie for 4th Prize.—R. A. Thompson, Atwood	93.48
J. B. Doan, Birnam	93.48
20 One-Pound Prints, Creamery Butter:	
1st Prize.—Jno. Cuthbertson, Sebringville	94.66
2nd Prize.—R. A. Thompson, Atwood	93.99
3rd Prize.—A. G. Patterson, St. Thomas	93.82
4th Prize.—E. M. Johnston, Innerkip	93.65
56-lb. Box, October Creamery Butter:	
1st Prize.—A. G. Patterson, St. Thomas	95.65
2nd Prize.—W. G. Medd, Winchelsea	93.99
3rd Prize.—J. R. Almont, Welland	93.48
4th Prize.—E. J. Sleightholm, Strathroy	92.99

Special Prizes.

By The Heller & Merz Co., 22 Cliff St., New York:

To the butter-maker securing the highest score on butter in Classes III and IV, colored with Alderney Butter Color, $10.00 in cash.—A. G. Patterson.

To the butter-maker securing the second highest score on butter in Classes III and IV, colored with Alderney Butter Color, $5.00 in cash, G. Richardson & Co., St. Marys, Canadian agents for Alderney Butter Color.—John Cuthbertson.

By the Ballantyne Dairy Supply Co., Stratford, Ont.:

One case of Hansen's Rennet Extract, to the cheese-maker securing the highest score on September White Cheese, Class 1, Sc. 1.—J. Cuthbertson.

One case of Hansen's Cheese Color, to the cheese-maker securing the highest score on October Colored Cheese, Class II, Sec. 2.—J. E. Stedelbauer.

By C. H. Slawson & Co., Ingersoll, for D. H. Burrell & Co., Little Falls, N.Y., Manufacturers of Chr. Hansen's Rennet Extract and Color:

One case of Hansen's Cheese Color, to the cheese-maker securing the highest score on September Colored Cheese, Class 1, Sec. 2.—J. T. Donnelly.

One case of Hansen's Rennet Extract, to the cheese-maker securing the highest score on October White Cheese, Class II, Sec. 1.—J. T. Donnelly and Mary Morrison.

Note.—All cheese competing for the special prizes offered by The Ballantyne Dairy Supply Co., and C. H. Slawson & Co., must be made with Hansen's Extract and Color. No special cheese required.

By the J. B. Ford Co., Wyandotte, Mich.:

One Three-piece Carving Set, with staghorn handles, sterling silver mountings, to the cheesemaker who is a regular user of Wyandotte Dairymen's Cleaner and Cleanser, having the best finished and most stylish looking cheese on exhibition.—J. T. Donnelly.

One Three-piece Carving Set with staghorn handles, sterling silver mountings, to the butter-maker who is a regular user of Wyandotte Dairymen's Cleaner and Cleanser, having the neatest and most attractive exhibit of butter.—A. G. Patterson.

Note.—All exhibits are eligible for these two special prizes.

By the Canadian Salt Co., Windsor, Ont., E. G. Henderson, Manager.

$30.00 in cash, to the butter-maker securing the highest score on butter exhibited in any class.—A. G. Patterson.

$20.00 in cash, to the butter-maker securing the second highest score on butter exhibited in any class.—J. Cuthbertson.

A medal to the cheese-maker securing the highest score on cheese exhibited in any class.—J. T. Donnelly.

Note.—No special cheese or butter required.

By The Western Salt Co., Mooretown, Ont., A. N. Leach, Manager:

One barrel Purity Cheese Salt, to the cheese-maker securing the highest score on September White Cheese, Class I, Sec. 1.—J. Cuthbertson.

One barrel Purity Cheese Salt, to the cheese-maker securing the highest score on October Colored Cheese, Class II, Sec. 2.—J. E. Stedelbauer.

One barrel Purity Dairy Salt, to the butter-maker securing the highest score on fifty-six lb. box creamery butter, Class III and IV, Sec. 1.—A. G. Patterson.

One barrel Purity Dairy Salt, to the butter-maker securing the highest score on twenty one-pound creamery prints, Class III, Sec. 2.—J. Cuthbertson.

Note.—No special cheese or butter required.

Cheese Buyers' Trophy—Challenge Cup, valued at $150:

To become the property of the exhibitor of cheese at the Winter Dairy Exhibition who shall receive the highest score three times, or twice in succession.—J. T. Donnelly.

Won 1903 by Frank Boyes; won 1904 by R. H. Green; won 1905 by O. Schweitzer; won 1906 by J. Patton; won 1907 by J. E. Stedelbauer; won 1908 by Mary Morrison.

INSTRUCTION AT CHEESE FACTORIES IN WESTERN ONTARIO, 1908.

By Frank Herns, Chief Dairy Instructor, London.

I take pleasure in presenting my second annual report of instruction in Western Ontario. This past season will be remembered for continued high prices for dairy products, successful from the patron's standpoint, and a somewhat more successful one for the maker. The patrons of a number of factories have shown their appreciation of the work done by the makers by increasing the price for manufacture. There are still many factorymen under-paid. Many patrons are beginning to realize the importance of having summer soiling crops, or silage to supplement the pastures during the dry season. More silos have been built and more corn has been raised in our dairy districts during the past year than for many previous years. This is a good sign of progress.

The instruction work was carried on along practically the same lines as last year. The same number of instructors were employed, and very little change made in the grouping of the factories. The instructors, as usual, spent a few days at the O. A. C., Guelph, before beginning work, and appreciated very much the lectures given by the professors of the College. Considerable time was given to discussing the work for the season, and

uniform methods of instruction were decided upon. The quality of the cheese up to the end of June was fine, but when hot weather came in July we had the same difficulty as last year with small round holes in the cheese at a few factories. This difficulty was discussed at the district meetings, and the general opinion seemed to be that the remedy was to get a better quality of milk, cut the curds fine, use the ¼-inch curd knife, get the curds firm before acid came on, not draw the whey to the surface of the curd too soon, get rid of all surplus moisture in the cooking, if possible, stir the curds sufficiently in the sink before piling, hold a little longer before milling, get the curds well flaked and give plenty of time before salting to get the curds well matured and free from moisture. Some of the late fall cheese do not get sufficient attention in the matter of curing before being shipped. Some of the buyers complained bitterly of the neglect on the part of some of the makers along this line. The fall cheese should not be allowed to go below a temperature of 58 or 60. The boxes in one section were also complained of by the buyers.

Very few acidy cheese were reported, and with the exception of a few weeks during the hot weather the quality was maintained, and in a number of cases improved. September was an exceptionally hot month, and the quality of the cheese suffered accordingly. When will the time come that changes in temperature will not have such an effect on the milk supply? The finish of the cheese is improving, and the August and October cheese were exceptionally fine. If we can ever get the milk in hot weather coming in good condition and cool curing-rooms established there is no reason why finest cheese could not be made during the whole season. In visiting cool curing-rooms during the very hottest weather one could not help but notice the fine smooth texture of the cheese, while in curing-rooms that were not protected from the heat the cheese were not nearly so fine. It seems to me cool curing would have as much to do with improving hot weather cheese as the milk supply.

It is discouraging to see thousands of cheese during hot weather well made, nicely finished, then placed in curing-rooms the temperature of which injures the texture and flavor. Evidently buyers will have to pay more money for cool-cured cheese, if cool curing-rooms are to increase in number.

Considerable improvement is shown at the factories in the matter of new and cleaner whey tanks, new floors, inside and outside appearances, new wells, better equipment, but we still have a few factories that are not kept up-to-date, and a few makers who do not keep clean and tidy what they do have, The owners and makers in these cases do not seem to realize the effect on the patron of having things in and about the factory clean and tidy. It is inconsistent for us to suppose that the patrons will improve in the care of the milk if the personal appearance of the maker, the unclean whey tanks and the untidy condition of the factory in general is a direct invitation for the patron to do likewise, and be untidy and careless in his methods of producing the milk.

I visited a number of factories where the sanitary conditions in the way of sewage disposal, impure water supply, and so on was very bad, and in every case these conditions were made satisfactory without compulsion. We do not seem to have much difficulty in getting some of the worst abuses remedied, but there is such a wide difference in men that it seems very difficult to get all the makers up to a point where all the factories can be pointed out with some pride as being kept absolutely tidy and clean, and fit places for making dairy products. There are a few factories that although they cannot be said to be unsanitary, yet are kept in such an untidy condition, that it is certainly discouraging to the instructors in their work.

The question of shipping green, immature cheese is important, and the cool curing of cheese and the cooling of milk is no doubt the most important problems in our dairy work to-day. Yet they seem to be two conditions very slow to improve. It is to be feared that the continuous shipping of green cheese will have a tendency to lower the standard of milk taken in at some of our factories, some makers reasoning that as the cheese are going out early, defects caused by the milk will not show before the cheese are shipped, and therefore a more inferior quality of milk is often accepted. Again, buyers ask for the cheese to break down early and in order that the maker may get green cheese to break down faster he is inclined to leave more moisture in the curd; and since the cheese are going out quickly he salts the curd too early, thus giving rise to open weak bodied cheese. The efforts of isolated individuals can have very little effect on these conditions, improvements must be brought about by the united efforts of every one in the business. The storing of ice on the farm is not increasing as rapidly as it should, neither is the building of cool curing-rooms. These are two points where a determined effort should be made to create an incentive for improvement. The benefits of storing ice on the farm does not seem to be well understood by the average patron. He needs ice as well as the city resident, to preserve food products. If some co-operative system of handling ice could be devised by which patrons could more easily get a supply for themselves and fill the ice house at the cool curing-room, it would be a great step in advance. Ice put up by a few patrons does accomplish some good, but it does not seem fair that a few should put up ice while the majority are negligent in this matter. Some such system, if it could be worked out, would encourage everyone to put up ice, build a milk stand near the ice house, and the benefits would soon be realized. A determined effort along this line is certainly important, for until such time as the milk is cooled in hot weather with cold water or ice, and the cheese cured in cool curing-rooms, further improvement in quality will be slow. Considerable improvement is reported in the quality of the milk, but when the hot weather arrives, too much gassy, over-ripe milk is still sent to the factories.

The system of pasteurizing the whey advocated last year has worked out successfully. The work was taken up in 55 factories. The press also have taken an interest in this subject and have helped to make public its benefits. We find where the whey was properly pasteurized it went into the patrons cans with an average acidity of .4 per cent. Some factories were able to return the whey with an acidity of not more than .25 per cent. Where the whey was not pasteurized the average acidity as it went in the patrons' cans was 1.15 per cent. As high as 1.7 per cent. We also find that where the whey is pasteurized it goes into the patrons' cans with a fat content of .22 per cent., and in a condition easy to handle. On the other hand where the whey is not pasteurized it goes into the patrons' cans with an average fat content of only .09 per cent., as low in some cases as .03 per cent. The latter means very sour, ill-smelling, gravity skimmed whey. A very doubtful argument against pasteurization of the whey is that the patron might not wash the cans as well as formerly. This is equivalent to saying that the more filthy the whey tanks are kept the more likely are the patrons to pay particular attention to properly washing the cans. In dealing with this matter I went straight to the men who produce the milk, to the women on the farm who usually have to wash the cans, who are in the best position to know the exact condition in which the whey has been returned for many years past. I sent out 1,500 letters to twenty-three factories where the whey was pasteurized for the first time, asking some twenty questions relative to the claimed improvement in the whey, and out of several hun-

dred answers received, the opinion was almost unanimous that pasteurizing the whey was a distinct improvement, and some expressed their willingness to pay their share of the cost to continue this system at their respective factories. I do not think the opinion of these patrons should be ignored. It seems somewhat inconsistent to ask patrons to improve in the methods of caring for milk, and then persist in putting into their cans this old, sour, foul smelling gravity skimmed whey. We may rest assured that human nature will always creep in, and some patrons will fail occasionally to entirely get rid of injurious bacteria from the cans. It is therefore reasonable to suggest that all patrons be put on the same footing so far as the whey question is concerned, and return them sweet germ free whey so far as possible, or so far as the practical system in use and the temperatures employed will making it germ free; then look after the careless ones and see that they take proper care of the milk and cans. Then the patron who is guilty of sending yeast infected milk may easily be detected by the curd test and dealt with accordingly. The temperature of 155 degrees to which the whey is heated must have in the time before it cools an influence in freeing the tanks and whey from large numbers of bacterial life, although not all. This system has practically annihilated the bitter and yeasty flavor formerly so prevalent at some of our factories.

Precautions. Pasteurization should begin as soon as possible after the whey reaches the tank to prevent the development of acid, and to take advantage of the temperature of 98 degrees before it begins to cool. Care must be taken that the temperature does not rise above 160 degrees. A higher temperature will precipitate the albumen and cause the whey to be flocculent and slimy. A temperature less than 150 degrees is too low, as the growth of bacteria is not prevented to a sufficient extent. Small or large quantities of whey should not be left over in the tank from day to day, as this whey will eventually become sour, and act as a culture in the new whey, rapidily raising the acidity and nullifying to a great extent the work of pasteurization. The boiler must be large enough to furnish economically the steam required. Inexpensive results cannot be obtained otherwise. The tanks should be as close to the boiler as possible, and the pipes insulated to prevent condensation and waste of steam before it reaches the whey. If live steam is used pressure as high as practical should be carried, and the steam not given too much vent into the tanks or the boiler will rapidly be emptied of water. Heat under steam pressure by keeping the live steam going gradually into the whey as fast as it is generated by the fuel. Beginning with good steam pressure less water will pass over into the whey. It is not wise to attempt to pasteurize unless it can be done properly. It will be a waste of steam and the results disappointing. Pasteurization of whey is for the purpose of getting rid, so far as possible, of the evils of unclean, sour whey, and is not a panacea for the evils of improperly cared for milk.

Cost. The cost will be according to the condition under which the work has to be done, such as size of boiler, location of tanks, whether the exhaust steam from the engine can be utilized, the system followed and experience. It will range from 50 cents to $1 per ton of cheese. Several tests made this year with live steam direct from the boiler under good conditions, allowing $4 per ton for coal, place the cost at 64 cents per ton of cheese. The patrons practically get all the benefits from pasteurization, therefore should pay each their share of the cost.

Different systems of Heating. The whey has to be raised from a temperaature of 98 degrees to 150 or 155 degrees, or about 52 to 57 degrees.

1st. Turn the live steam from the boiler under 60 to 80 pounds pressure directly into the whey, distributing through a simple system of three-quarter inch pipes to get an even temperature, and most economical use of the steam. This is the most effective system, and it does the work satisfactorily, but no doubt the most expensive.

2nd. Turn the exhaust steam from the engine into the tanks, and add sufficient live steam to raise the whey to the required temperature. This system is less expensive, where practical, but perhaps not quite so effective, as it may take longer to heat.

3rd. Turn the exhaust steam from the engine into the pipe leading from the pump or ejector to the upper tank, placing the connection several feet above the pump, turning a small pipe inside the large pump pipe a foot or so long in the direction which the whey is travelling. Add sufficient live steam to get the required temperature. This is still cheaper. Some little difficulty may be found in regulating the temperature at first.

4th. Raise the whey from the lower tank to the upper with an ejector, and add sufficient live steam in the upper tank to finish the heating. The ejector, if large enough, will increase the temperature about 20 degrees while the whey is passing through.

5th. Heat the whey in the lower tank with the exhaust steam from the engine to a temperature of 135 degrees, then raise with an ejector to the upper tanks, when it will be found to be at about 155 degrees, the ejector having supplied the extra 20 degrees. Any small quantities of whey left in the lower tank should also be heated at all times.

6th. Use a special heater, a device consisting of a pipe two feet long, 6 inches in diameter, capped at both ends—the cap drilled and threaded to allow pump and exhaust steam and overflow connections. Set heater upright. Connect exhaust steam to the bottom. Connect whey pipe at the top, also overflow pipe. Whey is heated before it passes out through overflow pipe. If exhaust steam not sufficient add some live steam. May have to be disconnected and cleaned occasionally. Cost about $6 to make. This special heater has been found very economical for pasteurizing skim milk. Should work equally as well for whey.

Experiments were carried on for four months at Kerwood factory *re* the making of whey butter, the results of which will no doubt be dealt with by the Department of Agriculture.

There are 200 cheese factories in the 6 groups and 7 outside factories, making the same total as last year. There are 16,295 patrons producing milk for these 200 factories; 16,287 tons of cheese made in 1907. This would average 81 patrons to the factory; 83 tons of cheese to the factory; 1.02 tons of cheese to the patron.

31 factories in the Simcoe group; 94 patrons to the factory; 92 tons of cheese to the factory; .98 tons of cheese to the patron.

34 factories in the London group; 78 patrons to the factory; 72 tons of cheese to the factory; .88 tons of cheese to the patron.

35 factories in the Listowel group; 86 patrons average to the factory; 67 tons of cheese to the factory; .75 tons of cheese to the patron.

36 factories in the Ingersoll and Woodstock group; 59 patrons to the factory; 110.5 tons of cheese to the factory; 1.89 tons of cheese to the patron.

36 factories in the Stratford group; 86 patrons to the factory; 100 tons of cheese to the factory; 1.1 tons of cheese to the patron.

28 factories in the Brantford group; 124 patrons to the factory; 65 tons of cheese to the factory; .5 tons of cheese to the patron.

REPORTS OF INSTRUCTION IN CHEESE FACTORIES OF WESTERN ONTARIO, 1908.

Group and Instructors	Factories	No. of patrons	No. tons of cheese, 1907	No. visits	No. call visits	No. curd tests made	No. of samples tainted	No. of lacto-meter tests	No. Babcock tests for adulterations	No. patrons visited	No. new cans bought	Average % fat in milk for season	Average % loss of fat in whey for season	Factories pasteurizing whey	Average % acidity of whey pasteurized.	Average % acidity whey not pasteurized	Average % fat in whey pasteurized	Average % fat in whey not pasteurized	Expenditure
Stratford:																			
Alex. McKay	36	3,118	3,600	118	101	510	260	4,340	146	83	514	3.5	.22	11	.38	1.17	.19	.1	$4,476
Ingersoll and Woodstock:																			
E. N. Hart	36	2,105	3,978	121	115	341	211	6,770	343	150	329	3.5	.24	18	.38	1.08	.24	.08	6,576
Simcoe:																			
Geo. Travis	31	2,920	2,860	94	65	68	40	4,556	80	77	333	3.5	.23	8	.31	1.37	.185	.11	3,285
Brantford:																			
R. H. Green	28	2,472	1,743	106	114	94	37	6,882	88	55	339	3.5	.23	6	.36	1.11	.23	.11	3,200
Listowel:																			
J. R. Burgess	35	3,023	2,211	101	80	93	19	6,698	63	49	308	3.5	.22	6	.3	1.09	.21	.08	2,577
London:																			
W. Hamilton	34	2,657	2,435	97	74	27	22	4,978	143	27	349	3.5	.23	6	.25	1 09	.22	.11	3,978
Outside Factories:																			
F. Herns	7	.....	.....	....	8	.....	....	.....	....	....	.....	....	....	....	....	....	....	....	.....
	207	16,295	16,827	637	557	1,133	589	34,224	863	441	2,172	3.5	.23	55	.4	1.15	.22	.09	24,092

The average percentage of fat in the milk for 1908 was 3.5. For May, 3.3; June, 3.37; July, 3.38; August, 3.5; September, 3.65; October, 3.8. The average loss of fat in the whey for season was .25 per cent. For May .226 per cent.; June, .223 per cent.; July, .226 per cent.; August, .236 per cent.; September, .223 per cent.; October, .241 per cent.

There were 637 full day vists, and 549 call visits, making a total of 1,186 visits to the factories; 1,143 curd tests were made, and 549 of these samples were tainted; 441 patrons were visited; 34,224 lactometer tests were made, being 850 less than last year; 863 Babcock tests made for adulteration, or 827 less than last year; 223 samples were found deteriorated—180 on one test, 43 on several tests, or 17 less than last year, showing that the system adopted last year of dealing with cases of adulteration by prosecution is having a marked effect in stamping out adulterated milk. 3,206 Babcock tests made other than for adulteration; 565 Babcock tests made for loss of fat in the whey; 2,272 new milk cans were bought, 584 more than last year; this is rapidly getting rid of old rusty cans. 23 factories are paying by test, 4 more than last year; 13 factories have a cool curing-room, only one more than last year; 19 factories where the whey is fed at the factory; 137 factories have milk testing equipment; 141 makers qualified to test milk; 74 factories repaired; 35 factories adopted the ¼-inch curd knife; 30 factories put in new whey tanks; 19 put in new vats; 10 factories were painted. Numerous other improvements are reported. Total expenditure for improvements, $24,092.

District meetings were held during November and December in the different groups, where many points of interest to the industry were discussed. The majority of these meetings were better attended than last year. Since the last Convention 129 annual meetings of patrons have been attended by the instructors and myself, with an average attendance of 40, reaching about 5,500 patrons. Applications are in for speakers to attend a number of annual meetings during this winter.

43 cases of adulteration of milk were reported by the instructors. These were looked after by the special officer appointed for this work, and fines ranging from $10 to $25 were imposed on the patrons. One case was defended, but the conviction was finally secured. This system of handling cases of adulteration seems to give general satisfaction.

The instructors have all worked hard and have done their best to make the season's work successful. I wish to express my appreciation of the loyalty and kindly feeling which the instructors have shown towards me. The very best of feeling prevails between the instructors, the Board of Directors of the Association, and myself. I also wish to thank the directors and members of the various committees for their hearty co-operation. I wish also to thank the cheese and butter makers, factorymen, and buyers for kindness to me and the pleasant relation existing this year.

I want to say a few words in connection with the pasteurization of whey. The press have helped us out in this matter to a great extent. I had a few figures that it took a considerable time to gather, and I have presented them to you because I believe this subject of the systematic pasteurization of whey is a step in the right direction of improved quality of cheese. (Applause).

CHEESE FACTORIES.

Stratford Group.—Alex. McKay, St. Marys, Instructor.

Factories:—St. Pauls, Thorndale, West Nissouri, Ballymote, Black Creek, Farmer's Union, Blanshard & Nissouri, Oliver, Fullarton, Sebringville, Maple Grove, Avonbank, Blanchard, Kintore, Evelyn, East Nissouri, North Oxford, Thamesford, Bennington, Red Star, West Zorra, Spring Creek, Strathallan, Brooksdale, Innerkip, Eastwood, Soho, Bright, Cassel, Tavistock, Oak Grove, German Union, Devizes, Proof Line, North Branch.

Ingersoll and Woodstock Group.—E. N. Hart, Ingersoll, Instructor.

Factories:—Belmont, Mapleton, Lyons, Springfield, Brownsville, Northwood, Harrietsville, Crampton, Burnside, East and West Oxford, Burgessville, Zenda, New Lawson, Mt. Elgin, Salford, Newark, Norwich Jct., Norwich Gore, New Durham, Harley, Cathcart, Diamond, Vandecar, Sweaburg, Foldens, Prouse, Culloden, Avon, Gore, Verschoyle, Dereham and West Oxford, Virtue, East Oxford, Losee, Brookbank, Westminister.

Simcoe Group.—Geo. Travis, Simcoe, Instructor.

Factories:—Lake View, Vienna, Straffordville, Fairground, Clear Creek, St. Williams, Erie View, Carholme, South Middleton, Springford, New England, North Bayham, Summerville, Delmer, Miller's Corners, Firby, Malahide, Yarmouth Centre, Union, Sparta, Dunboyne, Lyndoch, Walsh, Vittoria, Nixon, Tillsonburg, Windham Centre, Scotland, Kelvin, Bookton, Courtland.

Brantford Group.—R. H. Green, Cayuga, Instructor.

Factories:—Renforth, Alberton, Lynden, Grand River, Caistorville, South Cayuga, Clanbrassil, York, Villa Nova, Cockshutt's Road, Mt. Pleasant, Boston, Hagarsville, Harrington, Forks Road, Attercliffe Station, Canboro', South Grimsby, Woodburn, Bismarck, Excelsior, Lynn Valley, Waterford, Tyrell, Rockford, Caledonia, Jarvis West, *Black Creek.

Listowel Group.—Jas. R. Burgess, Listowel, Instructor.

Factories:—Molesworth, Carthage, *Milverton, Honey Grove, Avondale, Classic, Ellice and Logan, Willow Grove, Monkton, Maitland, Marion Beaver, Silver Corners, Ethel, Newry, Elma and Mornington, Elm Bank, Fordwich, Dominion, Donegal, Trowbridge, Wallace, Wyandotte, Rothsay, Cotswold, Goldstone, Paramount, Ripley, Huron, Pine River, Millarton, Harriston, Conn, Hawkesville, Wellesley.

London Group.—W. Hamilton, Woodstock, Instructor.

Factories:—Maple Leaf, Banner, Dorchester Station, Dorchester Union, Mossley, Gladstone, Thames, Pond Mills, White Oak, Glanworth, Scotsville, Delaware, Mt. Carmel, Strathroy, Watford Union, Warwick, Maple Grove, Ridgetree, Uttoxeter, Galabank, Wyoming, Walnut, Napier, Appin, Payne's Mills, *Muncey Road, Sifton's, *Keyser, *West Magdala, *Inwood, *Kerwood, Crinan, Colinville, *Brigden.

Outside Factories:—Laurel, Jessopville, Conover, Dundalk, Lavender, Vittoria and Avening.

CREAMERIES.

Western and Southern Group.—Fred. Dean, Guelph, Instructor.

Creameries:—Forest, Corbett, Lucan, Vanneck, Medway, Winchelsea, Shamrock, Exeter, Keyser, Kerwood, Lambton, Brigden, Inwood, Glencoe, Muncey Road, Cedar Springs, Elgin, St. George, Princeton, Beachville, King Edward, Point Albino, Welland, Vinemount, Imperial, Cayuga, Union, Brownsville, Strathcona, West Magdala, Wallacetown, Ridgetown, Dresden, Merlin, Maple Leaf, Farmer's Friend No. 1, Farmer's Friend No. 2, Maple City, Sleightholm's, Black Creek.

Eastern and Northern Group, Mack Robertson, St. Marys, Instructor.

Creameries:—St. Marys, Nelson, Palermo, Halton, New Dundee, Nithside, Silver Springs, St. Jacobs, Stratford, Whirl Creek, Winthrop, Holmesville, Dungannon, Bluevale, Whitechurch, Brussels, Egremont, Star, Bervie, Climax, Underwood, Paisley, Walkerton, Ayton, Chesley, Tara, Wiarton, Pleasant View, Neustadt, Alsfeldt, Milverton, Grand Valley, Credit Valley, Fergus, Beaver Valley, Whittington.

*Combined butter and cheese.

THE CARE OF MILK FOR CHEESEMAKING.

By George H. Barr, Dairy Division, Ottawa.

I would like to congratulate the Dairymen of Western Ontario on several things. I had an opportunity of seeing a number of the prize cheese yesterday, and I must say they are exceptionally fine and exceptionally uniform in quality. There is no use in making only a few good cheese, and I am glad to know you are continuing the good work, and making a number of fine quality. One point of interest to me is the fact that the trophy has gone to a district which never had it before. There are some lessons to be drawn from that. I had an opportunity of visiting Mr. Donnelly's factory three or four years ago, and my impression was at that time that if that man ever struck the right track he would make some of the fellows in this country sit up. The reason I had this impression was because everything about that factory was scrupulously clean, and the cheese were the best finished I saw in Western Ontario that year, barring none. He has got to go fast to keep that trophy. I would like to see it go to the Brantford section. The Northern fellows have had this business for a long time. I believe it is up to the men in the Eastern Districts to do the best work they know how, in order to win that trophy. I heard something about western creamery butter last year that made me warm, because I do not like to hear Western Ontario run down. One of our Montreal exporters said something that was anything but complimentary, that the Western Ontario creamery butter was not as good as it used to be. Four years ago I had hopes that Western Ontario butter would take a good standing, and as far as I have been able to learn the reason you are not progressing as you should is when the patrons commenced to give you better cream then the manufacturers started gatherng fewer times, and that is not right. I believe the manufacturers are making a mistake, and I hope you will think of that, and make more trips for the cream. You must get the flavor, and that is something you have not got.

Although this question of the care of milk for cheesemaking is an old topic, and one which has been discussed in the press and at dairy meetings probably more frequently than any other, it is still a subject in which all dairymen should be deeply interested, for the very foundation of successful cheesemaking lies in the production of clean, sweet milk.

It is the general opinion that milk for cheesemaking should be "aired" in some manner after it is drawn from the cow, and for many years patrons of cheese factories were advised to use some special style of aerator, or expose the milk to the air by dipping it.

A few years ago Prof. Dean reported some experiments on this subject. His conclusions were that there was no advantage in aerating milk for cheesemaking. Many dairymen at that time thought such a statement almost rank heresy, and that his College experiments were scarcely applicable to factory conditions; but there has been a growing conviction in the minds of dairymen that aeration is of little value.

In order to throw some further light on this important, if somewhat threadbare subject, Mr. Ruddick decided to have some experiments conducted last summer under factory conditions.

It was my privilege to carry out this interesting and instructive work, with the able assistance of Mr. J. G. Bouchard, also of the dairy staff. Our object was not to secure information from a bacteriological standpoint, but rather to discover what effect different methods of handling the milk at the farms would have on the quality of the curd and cheese.

The principal points we had in view were, to ascertain the advantages or disadvantages of aerating, of cooling and aerating, and of cooling the milk without aeration under ordinary farm conditions, and if possible, discover a simple, convenient, inexpensive and effective method of treating the milk, so that it might be delivered at our cheese factories in such a condition that our cheesemakers would not have to contend with gassy and other undesirable fermentations during the process of manufacture, or suffer losses from unclean flavors in the cheese.

We made a very convenient arrangement with Mr. John McEwan, proprietor of the Rideau Queen cheese factory, Smith's Falls, whereby we had the use of his creamery room for the season, and also a number of his patrons were willing to allow us the privilege of going to their farms to arrange for the care of their milk. At first we thought of taking the milk from six or eight patrons, but we found it would be difficult to get all the details in connection with the treatment the milk received at the farm from so many, and finally decided to use the milk from two patrons, Mr. Walter Hyslop and Mr. D. Condie. These two gentlemen had the largest herds convenient to the factory, and also had ice stored for summer use. Mr. Condie's farm lies on the west and Mr. Hyslop's on the south side of the town of Smith's Falls. Part of Mr. Condie's farm consists of drowned land from the Rideau Canal, and the cows pastured a good part of the summer on the flats around this swampy section. Mr. Hyslop's farm had some low land as well as high and stony soil. One could scarcely call either farm ideal pasture land for the most delicate flavored milk, but we were very glad to have these conditions, thus giving an opportunity to see results from what may be considered about average farm lands.

Mr. Condie's herd of 17 cows consisted of eight grade Ayrshires, four grade Holsteins, and five grade Shorthorns. Several of these cows had aborted during the winter, but were milking fairly well all season. One cow had been milking over a year.

Mr. Hyslop's herd of 18 cows consisted of one pure-bred Holstein, two grade Holsteins, and fifteen grade Ayrshires. A number of his cows had also aborted during the winter. These cows were fed silage for several weeks in July, which kept up the flow of milk well, with no detrimental effect on the milk for cheesemaking.

The cows were always milked in the stable at both places.

Mr. Hyslop's stable was frame and Mr. Condie's a stone basement under the barn. Both had wooden floors, which could not be considered by any means as sanitary as cement. The walls, ceilings and floors were dusty.

The milking was done at Mr. Hyslop's by his four sons, and at Mr. Condie's by himself and two hired men.

At both places, bright tin pails were used to milk in. No special regulations were asked for in regard to milking, or feeding the cows, our object being to take the milk as they gave it to us, and see what result different treatment at the farm would have on it when manufacturing it into cheese.

The milk was delivered to the factory in the usual way, each patron delivering his own milk. Mr. Hyslop usually came to the factory about seven o'clock, and Mr. Condie about eight o'clock each morning, which gave us ordinary factory conditions for delivery.

The equipment used at each farm consisted of two Champion aerators, a box dividing the milk equally in the cans, a shotgun can for ice and water, a dipper, a thermometer, and two half barrels for setting the milk cans in cold water.

Only the evening's milk was treated. The morning's milk was not aerated or cooled.

Mr. Bouchard and myself were always present at the farms when milking commenced in the evening to take charge of the milk as soon as it was drawn from the cow. At Mr. Condie's as the cows were milked, the milk was strained into shotgun cans sitting behind the cows, and then carried to the milkstand. At Mr. Hyslop's the milk was poured into a strainer pail in the stable, and carried to the milkstand and strained into the milk cans.

The milk was divided by pouring it into a square tin box placed on top of the aerators or milk cans. An outlet at each end of this box allowed the milk to flow quite accurately into the two milk cans marked A and B. The morning's milk when mixed with the evening's at the farm was divided in the same manner. The different lots were treated as nearly alike as possible at both farms. At the factory, two small vats were used, the A lots of the evening's milk from each farm being put into vat A, and B lots into vat B. The morning's milk was divided equally into each vat.

Curd tests were made of each can of evening's milk and also of the morning's milk. Babcock tests were made of the milk in each vat after it was received, and during the whole season only four times was there any difference in the per cent. of fat, showing that the different methods of handling the milk had not much effect upon the per cent. of fat. The per cent. of fat in the milk from the two herds was practically the same.

The per cent. of acid was determined in each lot of evening's and morning's milk by the Acidimeter or Alkaline test.

Milk from the Hyslop farm nearly always showed a higher acidity than that from the Condie farm.

The average tests for the season were as follows:

	Evening's Milk.		Mixed Milk.		Morning's Milk.
	A	B	A	B	
Hyslop	.169	.174	.170	.171	.165
Condie	.160	.162	166	.168	.160

When the milk was cooled in the evening and the morning's milk delivered in separate cans, ½ of one per cent. starter was added as soon as the first milk was received (about seven o'clock) and often the milk would not set until about ten o'clock.

We had to use a starter all the time, in order to get the curds in condition to leave them and go out to the farms to look after the milk in the evening, and in many cases, its use gave better conditions in the curds from gassy milk, than if no starter had been used.

No effort was made to do experimental work regarding methods of manufacture. All the curds were handled carefully, as nearly alike as possible, and according to the best methods in practice in our cheese factories.

The cheese were kept in the factory curing room from 12 to 15 days, then shipped to the Ottawa Cold Storage. The average temperatures in the curing room were in June 71, July 72, and August 68 degrees. The cheese were scored for flavor just before being shipped and again on September 21st in the cold storage.

Although we have considerable information relating to the number of pounds of milk required to make a pound of cheese in the different experiments, we feel it is scarcely reliable on account of the small quantities of milk used.

Flavors in the milk, and flavor and texture in the curds and cheese, may be secured equally as well from small quantities as from large, but to get reliable results in regard to the losses in manufacturing, we believe it is necessary to do the work in the large factory vats. This we hope to do another year.

Location of the milk stands where the milk was aerated and cooled. Lantern slides were here used to illustrate the utensils used at the farm and the position of the milkstands. The first slide showed Mr. Hyslop's milkstand. To the right is the corner of the barn, the cow stable being nearer the stand at the end of this barn. This stand is 60 feet from the cow stable door, and the space between is in grass and fairly free from manure or dust. On the other side of the stand is the orchard and backyard of the house. The barnyard is on the opposite side of the stable. All the manure was hauled out early in the season. Fault may be found with the location of this stand. It is probably a little too close to the stable, and the buildings and orchard prevent getting the full benefit of the wind from all directions; yet it is better situated than hundreds of milk stands through the country. Everything around it was kept clean and tidy. Notwithstanding the apparent favorable location of this stand, 38 per cent. of the curd tests from milk dipped or run over an aerator here, were gassy and not clean in flavor.

The second slide showed the milkstand at Mr. Condie's. It is at the end of the woodshed, in the corner of which is stored the ice. A roadway runs between it and the house, the horse stable is about 40 feet distant, directly in front of the stand, and the barnyard and cow stable on the other side of this, about 136 feet from the stand. A hogpen is situated 88 feet from the stand, a short distance from the other end of the woodshed. This stand may be considered in a good location, as there is good circulation of air and not much dust surrounding it, yet 61 per cent. of the curd tests from milk dipped, or run over aerators here were gassy and not clean in flavor.

The third slide showed a splendid gas producing situation, the waggon standing in the barnyard not far from the hogpen door. Milk exposed to the air or left open all night here, never failed to give gassy and floating curds in the curd test, as well as gassy flavors and gas holes in the curds.

The fourth slide showed the method of cooling the milk without aeration at the Hyslop farm. The tub seen here is part of a gasoline barrel which cost $1.25 and made a tub for each farm. Our custom was to fill this tub with water from the well before milking commenced, and set the milk can in it, and as the cows were milked, the milk was strained into the can. We found that 180 to 200 lbs. of water was all that was necessary to cool one-half of the milk from 18 cows. This milk was not stirred or dipped. The only agitation it received was to stir it with the thermometer to get the temperature, and as soon as milking was finished, the cover was put on the can and left sitting in the water all night. The water used came from the well at 46 degrees temperature. The average temperature of the water in the tub when we left it (about five minutes after the milking was finished) was 59.6 degrees and the milk at the same time was 77.3 degrees. The average temperature at the factory the following morning was 66.5 degrees, and only 6.6 per cent. of the curd tests from milk so treated on this stand were slightly gassy and not quite clean in flavor.

The fifth slide showed where the milk was cooled by setting the milk can in a tub of water at Mr. Condie's. This platform is in the corner of the barnyard, a corner of the horse stable is seen to the right. The cow stable is directly in front of this trough, about 96 feet distant. All around this

trough is bare ground, where the cows often stood both before and after milking, and in dry weather it was very dusty. The manure pile from the horse stable is about 52 feet from this platform.

The pump is situated behind the horse stable, 93 feet from the trough, and the water piped under ground to the trough. A gas pipe was put into the upright pumplog to carry the water to the tub at the end of the trough, and a spout put from the tub into the trough. All the water pumped for the stock had to pass through this tub, flowing out at the top into the trough. By this arrangement, not five minutes were required to take care of the milk, for when enough water was pumped to water the cows, the milk was cooled enough to leave as soon as the milking was finished.

This milk was not aerated in any way. The cover was put on the can as soon as milking was finished. The temperature of the milk and water was practically the same as at the other farm, and the curd tests from this milk showed the same results also, only 6.6 per cent. were slightly gassy and not quite clean in flavor.

The curd tests from the milk aerated by dipping or running over an aerator at this platform gave 71 per cent. gassy and not clean in flavor, some of them floaters.

We did not go to very much expense in arranging to cool the milk as I have stated, but the results were so sastisfactory that I would strongly recommend patrons of cheese factories who have a good water supply to construct such a tank as shown on the screen. It should be placed between the pump or water supply and the watering trough, and all the water used for watering the stock would pass through this tank and cool the milk while doing so. The important point to observe in connection with such a tank is, the overflow must be at or near the top of the tank, so that the water which is warmed by the milk may overflow into the watering trough. The warmer water is always at the top in a tank. Such an arrangement will practically guarantee sweet, clean flavored milk, with a little or no time spent on it, which is quite a consideration during the busy summer months on the farm. When ice is used, the water in the tank should not be changed as it would only waste ice.

A number of illustrations were given showing the condition of the curd tests and curds, from milk aerated, and aerated and cooled, compared with curds from the same milk cooled without aeration. They all showed that the milk exposed to the air gave curds full of gassy openings, while those from milk cooled with as little exposure to the air as possible were free from gas.

Tables were also shown which gave the percentage of defects in the curds and cheese in the different groups of experiments as follows:

Milk aerated by dipping with a dipper:

Curd tests not clean in flavor	83.4 per cent.
Curd tests gassy in texture	77.8 per cent.
Curds in the vats not clean in flavor	88.9 per cent.
Curds in the vats gassy in texture	77.8 per cent.
Cheese not clean in flavor	77.8 per cent.

Milk run over a Champion Aerator:

Curd tests not clean in flavor	68.2 per cent.
Curd tests gassy in texture	68.2 per cent.
Curds in the vats not clean in flavor	50 per cent.
Curds in the vats gassy in texture	50 per cent.
Cheese not clean in flavor	75 per cent.

Percentage of defects in total lots (21) aerated without cooling:

Curd tests not clean in flavor	75 per cent.
Curd tests gassy in texture	72 per cent.
Curds in the vats not clean in flavor	66.6 per cent.
Curds in the vats gassy in texture	61.9 per cent.
Cheese not clean in flavor	76.1 per cent.

Milk cooled by setting a shot-gun can of cold water, or water and ice in it. No aeration.

Curd tests not clean in flavor	10 per cent.
Curd tests gassy in texture	20 per cent.
Curds in the vats not clean in flavor	...
Curds in the vats gassy in texture	...
Cheese not clean in flavor	20 per cent.

Milk cooled by setting milk cans in a tub of cold water. No aeration.

Curd tests not clean in flavor	6.6 per cent.
Curd tests gassy in texture	6.6 per cent.
Curds in the vats not clean in flavor	...
Curds in the vats gassy in texture	...
Cheese not clean in flavor	13.3 per cent.

Percentage of defects in total lots (20) cooled without aeration.

Curd tests not clean in flavor	8.3 per cent.
Curd tests gassy in texture	13.3 per cent.
Curds in the vats not clean in flavor	...
Curds in the vats gassy in texture	...
Cheese not clean in flavor	15 per cent.

Milk cooled and aerated:

Curd tests not clean in flavor	44 per cent.
Curd tests gassy in texture	44 per cent.
Curds in the vats not clean in flavor	40 per cent.
Curds in the vats gassy in texture	20 per cent.
Cheese not clean in flavor	60 per cent.

It will be readily seen from the above figures that by far the best results were obtained from milk cooled by setting the milk cans in water and putting the covers on the cans immediately after milking was finished. This particular method of treating the milk was carried on during the very hottest weather in July and August last, and the milk arrived at the factory in practically the same condition every morning, sweet and clean in flavor. If all milk for cheesemaking was handled in this manner, and the milk cans and pails kept perfectly clean, I believe we would practically do away with all gassy curds. The cheesemakers would have shorter hours, they would make more cheese per hundred pounds of milk, and have very few, if any, bad flavored cheese.

Mr. PAGET: Did you say 66½ was cool enough?

Mr. BARR: I wish I had something more definite on that point, but I want to say that our experience was from the small quantity we were handling, that we got that milk in too sweet to make cheese, and I will go this far and say that if you get the evening's milk at the factory cooled to 70 degrees it would be all right.

A MEMBER: Would lower than 66 be too cool?

Mr. BARR: Everybody knows you cannot get through your day's work too early, and I have always felt that if any man loses half an hour in the morning it is wasted time. I believe you can get better cheese if you have the milk set half an hour or fifteen minutes after it is in, and I believe the milk should be delivered at the factory at about 70 degrees.

Mr. Steinhoff: I would like to draw attention to one point Mr. Barr mentioned in his opening remarks regarding the quality of creamery butter in Western Ontario. That statement coming out from an authority like Mr. Barr makes it quite a serious thing for the men who are interested in western creamery butter. If Mr. Barr saw the butter from the best creameries in Western Ontario, I would accept his statement, but inasmuch as that statement comes from a dealer in Montreal, I think it changes the situation, and I think an explanation should be made.

The situation has changed since Mr. Barr left Western Ontario. The highest prices have been obtained for butter in Western Ontario, and the products of our best creameries has not been going to Montreal. The butter that goes to Montreal is from the inferior creameries. Last summer we sold about 2,000 boxes in Montreal and 6,000 boxes in Western Ontario. The quality of western butter has been found better than eastern butter. The butter from Eastern Ontario is inclined to go flat. I am simply saying this in justice to the best creameries in Western Ontario.

ADDRESS.

By G. A. Putnam, Director of Dairy Instruction.

As it is within a few moments of the time for adjournment for this session, my remarks will necessarily be brief. I wish first to compliment this audience upon the close attention which has been paid to the addresses delivered and the papers read since this Convention began. It is encouraging to those who are officially connected with dairy work in the Province to note this evidence of increased interest. The questions which have been asked, the discussions and the comments at this Convention—all indicate that the dairymen are giving closer attention and study to this industry which is not of local importance only, but a national question, and all who are connected with it in any way should feel proud of the standard which has been set and the progress which is being made from year to year.

We hear from the exporters, the Chief Instructors, the instructors in charge of the various syndicates, proprietors of factories, makers, and patrons, encouraging reports regarding the instruction work of the past year. The Department of Agriculture which finances and directs this work, is gratified with these expressions of appreciation, and considers that the large expenditure of funds is quite justified by the good accomplished and the appreciation shown. No doubt there are some weaknesses yet to be overcome, and there is certainly much yet to be accomplished.

Both Mr. Publow and Mr. Herns, Chief Instructors for Eastern and Western Ontario respectively, express themselves as very much pleased with the progress along dairy lines throughout the Province during the past season. Mr. Publow informs us that the progress in Eastern Ontario during 1908, has been more marked than in any previous year, and he believes that the results following the efforts of the past season will compare favorably with the advance made in any two previous years. This speaks well for the future success of dairying in Ontario. The factories in Eastern Ontario are being fixed up as fast as the resources of the proprietors and the increase in volume of business will permit, and the farmers are taking better care of their milk

and feeding and caring for their cows in a better manner. All this indicates the interest and faith which the dairymen of the east have in their industry, and augurs well for the future.

Up to the present we have been building a foundation, trying to establish a solid foundation upon which to work. I think our foundation is now fairly secure and we are in a position to go on to greater things. Even though we have accomplished a good deal for the maker, proprietor and the producer, there is still much to be desired so far as all and each of these are concerned. I consider, however, that in some respects, we have not much more than made a start in dairy methods in this Province. I refer chiefly to the sanitary production of milk. This is a feature of the work which is certain to receive increased attention as the years advance. And the ultimate success or failure of the industry will depend largely upon the degree to which cleanliness is observed in all branches of the work.

You will remember that it was only two years ago that we were able, through a change of system of instruction and the increased funds voted by the Legislature, to include every creamery and factory in the Province in our system of instruction, and it was only after we got that method that we were able to establish that uniformity which is essential in the successful production and marketing of the products of the farm, and especially true of dairy products. If one poor lot of cheese and ten lots of superior quality are sent to the same market, the consumers are inclined to judge future shipments from the same place, not by the ten good lots received, but by the one inferior sample. The consumers show a tendency to remember most distinctly that which has not pleased, rather than that which suited their fancy. It is very essential then that we endeavor not only to maintain a high standard but also to secure uniformity, for we are judged by the poorest goods that we export. It is not just that one factory should be allowed to injure the good reputation of Canadian cheese, when fifty other factories are spending money and effort in an endeavor to maintain quality. And when we come to the patrons, we are surprised that men, who are spending money and devoting time every day, giving extra care to their milk according to approved sanitary methods, will allow one or two patrons who are indifferent as to the care which they take in the producing and handling of their milk, to lessen the value of the total output of the factory. This is unjust, and the remedy is largely in the hands of the people.

We have legislation now by which we are able to control the sanitary conditions not only upon the premises of the producers but also at the factory, and with a proper exercise of the power given by the Legislature, we should be able to go on to better things. We have a very good foundation upon which to work. It may be, however, that there are one or two stones yet to be put into this foundation. In Eastern Ontario especially, we have too many factories and in Western Ontario in certain sections, we are going to have too many factories in the near future unless we bestir ourselves. It remains with the factorymen of this Province as well as the producers and all others connected with the industry to see that the erection of new factories is regulated in some way. I am sorry that I cannot lay before you some definite plan whereby those who propose the erection of a factory within the territory now being served by other factories which are well equipped, might be prevented from putting up a competing factory of small capacity, in which they cannot afford to pay the maker a sufficient sum of money to make it a paying business for him in which there is little or no prospect of making any interest on the investment. This is a problem which I trust you will consider, and it may be that legislation will be necessary; but governments do not usually undertake to legislate to regulate such matters, unless

they are asked and urged to do so. The elimination of the unnecessary small factories already established, and the control of the building of factories is a matter that must be dealt with in the near future. I merely throw out the suggestion to you.

NOTE.—The speaker here made brief mention of the results of experiments in the manufacture of whey butter under factory conditions in both Eastern and Western Ontario. Full report of these experiments appear in the Appendix to this report.

Mr. Putnam continued:

It will not pay any factory to make whey butter unless it is receiving a very large quantity of milk. One of the most important considerations is that it puts a premium on carelessness on the part of the maker and would thus tend to lower the quality of our cheese. If any of the factory men here contemplate the manufacture of whey butter, I would advise that they study very carefully the results of the experiments conducted in Eastern and Western Ontario last season, before taking action in the matter.

We took a census last summer of the average production of the cows of Eastern Ontario, and in some syndicates comprising as many as forty factories we found that the average production of each cow was not more than 2,500 pounds for the factory season, and two or three groups went even below this. What does this mean? It means not only that a great many of these cows were being kept at a direct loss, but that the average of the cows little more than paid for keep.

It is a reflection upon the farmers to feed cows the way some are fed during the hot dry months of the summer and early fall. The great majority of farmers, even yet, neglect to provide suitable food for these months, although there is a growing tendency on the part of the dairymen to make provision for the proper soiling of their cows during the summer. It is unfair to the cow to test her unless you give her a fair amount of food; and on the other hand there are, I think, a number of cows which would be ashamed to accept the food provided for them, could they read the records of their production for the season.

Might I refer again to the sanitary production and care of milk upon the farm for factory and creamery purposes? We occasionally see articles and illustrations descriptive of the great care taken by dairymen who are supplying certified milk for consumption in the cities, and I am convinced that the cost of such equipment and the large expense to which the proprietors are put for maintenance and labor tends to discourage rather than encourage the average farmer to improve his equipment and methods. He realizes that he cannot erect stables and instal equipment upon any such lines as the majority of those who are producing certified milk have adopted, and the result is that he does not make any effort at all towards improving the conditions surrounding the production of milk upon his farm.

The proprietors of a farm supplying certified milk for New York City wash their cows and spray them, comb them and house them in well ventilated stables that are washed regularly from top to bottom and are kept scrupulously clean in every respect at all times. Just before milking the cows at this dairy, the air of the whole building is treated with a fine spray which is allowed to settle, thus taking all dust from the air. The helpers are never allowed to wear the same suit twice and they take a bath two or three times a day.

We certainly have a long way to travel in Ontario before we reach any such perfection as this. And I make mention of this equipment merely to impress the fact that there is no necessity for dairymen who are furnishing milk to cheese factories to instal any such equipment or follow like methods.

We find in some of the cities of Ontario that there is great agitation, especially on the part of the medical people, for a better supply of milk. If we get legislation enacted which will require the farmers to meet such conditions as some of the medical men are asking for, two-thirds of the farmers will at once dispose of their herds and go out of the dairying business. In anything of this kind you must be content with gradual progress. You cannot jump from the methods of to-day to perfection in a few weeks nor yet in one or two years.

What we want to-day is not that good farmers shall take better care of their milk, but that those who are not taking good care of their milk shall be influenced in some way to adopt approved methods. Mr. Barr has made it clear to us that we can take sufficient care of the milk without even a supply of ice on the farm; all that is necessary is to use the coolest water we have at hand. We do not require the farmers to wear white suits but we do ask them not to search out their dirtiest suits when they go to milk. We have been reading of model stables for cows, and these are all very well and good in their place; but what we want is that the farmers will take proper care of the stables which they have at the present time. Clean out the stables that you have. Do not wait until you are able to put up a model barn, but clean up that which you have. The success of the industry is going to depend upon gradual growth and improvement. We are making progress, and if we all work unitedly in this matter of clean milk I think our success is practically assured.

It is our intention during the coming season to pay more and more attention to the patrons, and see that they are given more instruction in the matter of producing and taking care of the milk. The Department, I assure you, is going to do its best for the development of this great industry, and we are asking the farmers to give us intelligent and earnest support.

DAIRYING IN SASKATCHEWAN.

By W. A. Wilson, Saskatchewan Dairy Commissioner, Regina.

This is the first opportunity I have had of appearing before an audience in Western Ontario, and I can assure you it affords me a great deal of pleasure to be with you at this time. When it was suggested that I should come here for the purpose of attending both conventions in Ontario, there was no hesitation on my part in accepting. We were told last night that we heard too much of the West and not enough of Ontario. Now we have no argument with you in that respect, but I can only say, that although you have heard a great deal of the West in the past you are going to hear more of it in the future; and any one who has an opportunity of visiting the West, will find that the energy and the ability that has been put into the work out there is bound to be followed by results, and the West is bound to be known throughout the length and breadth of the land. (Applause.) We extend a very cordial invitation to any one who may be travelling through our Province to step off at Regina and look us up at the Department of Agriculture, and you will find we are men like yourselves and willing to give you all the information and help that we can.

We are profiting to a large extent by your experience in the East. We consider that at the present time we stand where you stood thirty years ago. We are the infant dairy Province of the Dominion. Our legislation deals

with creamery work only. We have no cheese factories, nor will we have them for the next fifteen years. There were a few cheese factories in the Province at one time, the last one was in the year 1900, and that closed down because the hauling of the milk cost the farmer exactly $14.50 a ton.

We are also benefited by the experience of the States to the south of us. Ten years ago there were 994 creameries in the State of Iowa; at the present time there are only something over 500; almost 500 of them closed in ten years. Seventy per cent. of the butter was manufactured in 35 of these creameries, which goes to show there were a great many small creameries in the State, and it is said that in the next ten years that probably 50 per cent. of the now existing creameries will be closed. That is a condition similar to Ontario, because there are many cheese factories and creameries in the Province that are standing examples of mismanagement, over-competition, and many other things I might mention. There are buildings also that should never have been erected. The success of any business is largely determined by the conditions in which they were started, and having that in mind we are endeavoring since Provincial autonomy was granted to pass legislation which would give us control of the work in order that we might lay a good foundation and conduct the work in a proper way. To make the work successful you must satisfy the farmer, and at the present time we are discouraging small factories and we are endeavoring to have manufactured as large a quantity as possible in one creamery. Legislation was passed in 1906, whereby no company or association that contemplated the erecting of a creamery in the Province could build until their plans and specifications were inspected by the Deparment. The Department will send out plans free of charge to any one. The object of that is to prevent the erection of unsuitable buildings in which it would be inconvenient to make butter. We are looking twenty years ahead, and endeavoring to avoid that condition which you are now under. Another condition is that no building can be erected until the site and location has been approved by an officer of the Department. That is to guard against unsanitary conditions. Another condition deals with the location with respect to the distance from other creameries, and the creameries are operated on the cream-gathering plan, and no factory can be erected within twenty miles of another one without special permission. The Government also made provision for assisting creameries by way of loans, and a loan to amount of $1,200 is given at the rate of 3 per cent. It is re-payable in 5 years and secured by a first mortgage on the property. Each farmer must sign a form stating how many cows he will keep, and how much milk he is likely to send for six months, and unless 400 cows are promised we will not consider the application. By giving them this assistance, and offering them all the adivce we can, we keep in very close touch with the work. In 1907, the number of applications received was 37, and only one creamery was built. In order to promote centralization we offer to pay the express charges on all creameries established. That means that the farmer living close to the line of railway or 100 miles away is exactly on the same footing We adopt the system of weeding out the poor buttermakers, and the makers are engaged on the percentage basis. Last year we paid one man $190 a month for four months. This year we are paying a salary of $125 and guaranteeing six months' work. Another advantage in connection with centralization is the reducing the cost, and paying a larger price to the patrons.

We have also inserted a clause in our Act that any stockholder of a creamery who is not a patron could not receive more than 5 per cent. on his money. We are endeavoring to promote dairying in the districts where the land is adapted to mixed farming, and we are trying to establish the industry on a permanent basis.

INSTRUCTION AT CREAMERIES, 1908.

By Frank Herns, Chief Instructor for Weston and London.

There were in operation this year 77 creameries, or 4 more than last year; 9 of these made both cheese and butter; 14,145 patrons sent milk and cream to these creameries, or only 2,150 patrons less than are sending milk to the 217 cheese factories. This makes a total of 30,440 patrons engaged in producing milk and cream for the factories of Western Ontario.

In 1907, there was produced in Western Ontario, 2,932 tons of butter; in 1908, 3,270 tons, a gain of 338 tons. There were 184 patrons average to the creamery, 45 tons of butter average to the creamery, 462 lbs. of butter average to the patron. This does not include the dairy butter made or the milk and cream supplied to the different cities.

218 full day visits and 93 call visits were made, making a total of 311 visits; 405 patrons were visited, 248 more than last year; 68 creameries are cream gathered, 9 both cream gathered and separator. There are no entirely whole milk creameries in operation. 65 creameries are paying by the Babcock test, 6 more than last year; only 12 creameries are now paying by the oil test, and it is to be hoped this system of paying patrons will soon be entirely a method of the past. 7 creameries are using the scale for sampling cream for testing, 3 more than last year. 72 creameries are using the combined churn; the box churn has practically gone out of use. 14 creameries are using a pasteurizer, 7 more than last year. 13 creameries are using large cans for collecting cream, 12 are using individual cans, 6 are using jacketed cans, 15 are using ordinary cans, and only 18 are now using cream tanks. 38 creameries have first-class cream haulers, 36 only have fair class haulers, 16 of which have a very poor class of cream haulers. The cream hauler has a wide influence among the patrons, since on him depends, to some extent at least, the responsibility of getting the patrons to handle the cream in better condition, and he should be well informed on creamery conditions, and other practical points in order to give the patrons necessary information for improving the quality of the cream. 25 creameries are using a cooler. 49.1 degrees was the average temperature of the storages. This is far too high, and some effort should be made to maintain a lower temperature; butter soon loses its fine flavor if allowed to stand even for a short time at high temperature. 27 creameries kept the butter milk tanks clean, 22 in fair condition, and 21 in very bad condition; an effort should be made to keep these tanks clean as far as posible. The average amount of fat in the cream was 22 per cent.; for the Northern Creameries, 20 per cent., for the Southern creameries 24 per cent.

More uniform methods should be adopted by the creamery men. It would be well to cut out measuring the cream in inches and adopt the plan of weighing. Decide on a uniform system of paying patrons with butter fat or pounds of butter. Do away with the oil test, and all adopt the Babcock test. Have a system as nearly alike as possible in charges for manufacture. Then the patrons would know that every creamery was trying to do a good straight business.

648 tests were made by the beaker method for moisture in the butter, the average per cent. of moisture for the season was 14.33 per cent. There were 61 samples with over 16 per cent. of moisture; these 61 samples, however, came from 19 creameries, 6 in the Northern group, and 13 in the Southern group.

Further improvements are reported in the quality of the cream, in the quality of the butter, and in the general equipment of the factory. The total amount of money expended in creamery improvements was $8,240.00. I wish to also thank the creamery men and instructors for their kindenss to me. The instructors have worked hard to improve the quality of the butter, and did everything they could to make the season a success.

CREAMERY INSTRUCTION, 1908.

	Western and Southern.	Eastern and Northern.	Total.
	Fred Dean, Instructor.	Mack Robertson, Instructor.	
Creameries	42	35	77
No. of patrons sending cream	6,608	7,537	14,145
Tons butter made, 1907	1,474	1,458	2,932
Tons butter made, 1908	1,743	1,536	3,270
Gain in tons, 1908	260	78	338
Average No. patrons to creamery	157	212	184
" tons of butter "	.....	.....	45
Average lbs. butter to patron	.....	.....	460
Full day visits	119	99	218
Call visits	49	44	93
Patrons visited	305	100	405
Average % fat in cream	24	20	22
No. tests made for moisture	474	174	648
Average % moisture	14.32	14.35	14.33
Samples showing over 16% moisture	47	14	61
No. Creameries cream gathered	35	33	68
" " both C. G. & S	8	1	9
" " using Babcock Test	40	25	65
" " " Oil Test	2	10	12
" " " box churn	2	3	5
" " " combined churn	39	33	72
" " " scale for sample	3	4	7
" " " large cans, C. C	15	13	28
" " " jacketed cans, C. C	6	.....	6
" " " individual cans, C. C	12	4	16
" " " cream tanks, C. C	.....	18	18
" " first class storage	15	14	29
" " fair storage	22	6	28
" " poor storage	2	11	13
" " no storage	2	.....	2
Average temperature of storage	52°	46.2°	49.1°
No. of Creameries good water supply	31	31	62
" " fair water supply	10	5	15
" " good drainage	29	29	58
" " fair "	8	4	12
" " poor "	5	2	7
" " using culture	9	.....	9
" " " cooler	14	11	25
Expenditure	$5,820	$2,420	$8,240

REPORT OF NOMINATING COMMITTEE.

The report of the Nominating Committee was received and adopted. The list of officers elected appears upon page 6.

FOOD PRESERVATIVES.

By Prof. R. Harcourt, O.A.C., Guelph.

Wherever the conditions favoring the decay of food products exist, methods of preservation always have been and always will be an important question. Before the dawn of the Christian era, man salted, smoked or dried meat that he might preserve it for future use. The reason why dried meat, dried fruits, dried fodders, or salted and smoked meat, or heated and sealed materials did not decay may not have been understood, but the fact remains that these methods of treatment have been practised for thousands of years, and that they are still our most common and best methods of preserving foods to-day.

With the development of the science of bacteriology it has been made plain that the decay of food is due to organized and unorganized ferments, and that anything that will destroy or retard the action of these ferments will prolong the commercial life of the food substance. Further, the bacteriologist tells us that floating in the air around us everywhere there are innumerable germs of decay, putrefaction, and disease, which are only waiting for a favorable place for development.

Some of the conditions most favorable for rapid development of these organisms are, a suitable temperature; at between 70 degrees and 105 degrees F., they are most active; plenty of moisture; and an abundance of suitable food. A high temperature will destroy practicaly all of these germs. Hence, submitting food to the full temperature of boiling water is one of the most efficient methods of disinfection, and foods so treated and sealed to exclude air, will keep for a very long time. This is the method commonly practised in canning meat, fruit, and vegetables. On the other hand, a low temperature is unsuitable for the development of germ life. It does not destroy the life; it simply retards the action of the ferments. Consequently, the use of low temperatures, as cold storage, cannot be used to preserve food indefinitely, but rather as a means of keeping food temporarily. Thus it is that meat, fruit, and vegetables may be kept for some time in good condition in cold storage, that cheese ripens slower at the lower temperature, and that milk keeps sweet longer when well cooled.

Moisture is another essential to the development of germ life, and it is for this reason that when the greater part of the water is removed from a food it will keep longer. A moment's reflection will show how extensively this method of preserving food is used. The fodder for cattle is dried, meat and fruit are dried, and flour, in fact all cereal meals, soon spoil if too moist. Advantage is even taken of this principle to preserve milk, by removing moisture in making condensed milk and milk powders; etc. But many of our foods would be rendered undesirable if they had to be boiled or dried to preserve them. Salting and smoking would be equally undesirable, and cold storage is not always available. Hence there appeared to be need for some other means of preserving foods.

Consequently, with the development of our knowledge of the requirements of the various ferments in foods and the disease germs that may get into them, chemistry has made known the existence of many new compounds capable of either wholly preventing or greatly retarding the action of these organisms. These chemical substances are generally classed as antiseptics, and it is but natural that attempts be made to use them in the preservation of food. Their application is, however, restricted by the fact that many of them are actively poisonous, or render the food unpalatable, or

that they are too costly for use on a commercial scale. Those in common use differ from the old preserving materials in being almost without taste or odor, and in that they may be used in a sufficient quantities to retard the action of ferments without being detected in the food.

At the present time the chief chemical compounds, other than salt, sugar, and alcohol, used in the preservation of food are the following: 1. Borac or boracic acid and borates, the so-called "boron preservatives." 2. Sulphurous acid and sulphites. 3. Fluorides. 4 Salicylic acid. 5. Benzoic acid or benzoates. 6. Formalin or formaldehyde.

The boron preservatives are apparently the most used, and are preparations of boric acid and borax, with or without admixture of other preservative ingredients, such as salt, saltpetre, sugar, sodium carbonate, etc., and are generally sold in the form of a white powder under a great variety of names, which, as a rule, afford no clue to their real nature. They are commonly used in milk, cream and butter, for preserving meat food generally, and, to a smaller extent, in beverages.

Salicylic acid is said to come next in importance as regards the extent to which it is used as a preservative. It is a white powder, and is employed chiefly in wines, beer, cider, and temperance drinks, and in foods derived from fruit, as jams and jellies, in order to prevent alcoholic and other fermentative changes. It is also said to be used in canned goods.

Sulphurous acid, sulphites, benzoic acid and the benzoates are generally used in preserving beverages. The latter is also added to fruit and vegetable preparations, sometimes to canned soups, and more rarely to dairy products.

Formalin is a 40 per cent. solution of formaldehyde in water. It is diluted to various strengths and sold under such names as "freezine," "iceline," etc., as a preservative for milk chiefly, and to a less extent for other foods. In concentrated solutions it has a strong irritant odor, but used in milk in sufficient quantities to retard souring, it cannot be detected by taste or smell.

Nearly all the preservatives now on the market are advertised as being "entirely wholesome," "capable of keeping the various articles of food perfectly sweet and fresh for any length of time without the use of ice," that "its ingredients are all as healthful as salt," etc., etc. On account of the perishable nature of nearly all our foods, it is obvious that a substance having the properties claimed for the various commercial food preservatives would be of incalculable value. At the same time, it is important that nothing should be added to food which is toxic itself, or which interferes even to the slighest extent with the processes in the body. This last point is especially important in its relation to invalids and children.

Just whether these so called chemical preservatives are injurious to health is a disputed point. Formalin is, however, generally recognized as too strong a disinfectant to be employed in the preservation of human food, and its use for that purpose is therefore prohibited in nearly all countries that seek to control the nature of the food supply.

The effect on the system of small quantities of boric acid, borax, salicylic acid, salicylates, sulphurous acid, and sulphite has been thoroughly studied by the Department of Agriculture at Washington, and the conclusion reached was that when even very small quantities of these materials were taken into the system, they produced injurious effects. This is also the opinion of many medical men throughout this and other countries. It is not claimed that the small amount of preservatives a person would get from eating catsup containing benzoate of soda, or butter to which borax had been added, would do harm; but when we remember that milk, butter,

some kinds of cheese, meats, canned fruits, canned vegetables, etc., may all contain one or other form of these chemical preservatives, it will be seen that it is quite possible that in the aggregate a person may be quite unconsciously taking into his food a quantity of preservatives which may be decidedly injurious.

When a food is preserved by means of salt, sugar, or by means of smoking or drying, it is at once evident to the consumer; but if the food contain these newer preservatives he may not be able to detect them. Their use may possibly enable him to use inferior goods or to exercise less care in their preparation; but that should not be a valid argument in favor of their general use. Good wholesome foods have been prepared without the use of these preservatives, and in view of the definite conclusions of Dr. Wiley's investigation and the opinion of many who should be authorities on the subject, it would appear as though the consumer had a right to know whether the goods he purchases contain preservatives or not. So long as there is any doubt as to the wholesomeness of these materials, the public should be protected. Either the use of the preservatives should be prohibited, or the manufacturer should be compelled to state on the package in the plainest possible way the name and the amount of the preservative employed.

Coming now more particularly to milk and its products, there is a growing tendency to use preservatives to keep milk sweet. Milk is one of the very best media for the development of germs, and when drawn from unclean cows by unclean milkers in dirty stables, it is very likely to be very badly contaminated. If allowed to stand in the stable for sometime after the milking is done, matters go from bad to worse. It is not necessary to go into all the details as to how milk should be handled, it will be sufficient to point out that by exercising care and cleanliness and by properly cooling, milk can be kept in a perfectly sweet condition until delivered to the factory or to the consumer. The use of preservatives removes the incentive to cleanliness and encourages careless, slovenly, and dirty habits in all stages of the work, because it is known that the milk can be kept sweet anyway. The preservative does not destroy the myriads of germs which dirty milk contains; it only holds them in check, so that such milk may come to the consumer very heavily loaded with all manner of germs. Furthermore the preservative retards the development of the lactic acid ferments, which naturally control the putrefaction and other undesirable germs in milk, and these develop bad flavors even though the milk is still sweet. When we consider that milk frequently forms the main part of the diet of invalids and infants, those who are least able to withstand any injurious effects preservatives may have on the system, it is at once evident that milk, of all foods, should be kept absolutely free from these materials, and that every effort ought to be made to see that the producers and dealers do not use them. A further difficulty in this connection is that unless something is done to keep the public informed regarding the nature of the preservatives on the market, the contention of the vendors as to the convenience and harmlessness of them will prevail, and purchaser, dealer, and consumer may all be adding preserving material to the same milk, and thus render it wholly unfit for use.

With reference to the use of preservatives in milk intended for cheese and butter factories, it is impossible to condemn it too strongly. It not only encourages carelessness, but the man who does it decreases the yield of cheese from all the milk put into the same vat, for any material added to milk that will keep it from souring will prevent normal coagulation of all the milk with which it may be mixed. Consequently, it is to the interest of

any farmer to see to it that his neighbor does not use these materials. Again, as stated previously, preservatives may be added in sufficient quantity to check the lactic acid fermentation and thus the milk does not sour, but other undesirable germs may develop and cause bad flavors which will give the cheesemaker much trouble. Furthermore, it is argued by many that a little soda can do no possible harm to the milk, and yet it helps to keep it sweet. Soda is an alkaline substance, and a comparatively small amount of it will seriously interfere with normal coagulation of milk. Further, it prevents milk from souring by neutralizing the lactic acid as it is formed, and produces conditions favorable for the development of many undesirable germs, and bad flavors result. When such milk is mixed with that received from other patrons, not only the yield of cheese may be reduced, but the quality will also be affected, and, conseqently, the cheesemaker and patrons all suffer loss.

It is impossible to go into all the ill effects of preservatives in milk, but sufficient has been indicated to show that no man should be allowed to put any preserving material into milk, whether intended for town or city customers or for factory use, but that every effort ought to be made to produce clean, wholesome milk and to have it placed in the consumers' hands in the cleanest and most appetizing manner possible.

THE CREAMERY OUTLOOK.

By Prof. H. H. Dean, O.A.C., Guelph.

Because of the fact that in these modern times people say, "Give us the luxuries of life and we will do without the necessaries," and because of this other fact, that the cheese factories now have rivals in the milk condenseries and in the large and growing demand for milk in towns and cities, which will keep them pretty busy to meet the competition offered—in these facts lie the hopes of creamerymen. The demand for first-class butter seems difficult to fill. Tons and tons of butter from cold-storage are used during winter, though we have never seen any first-class butter come out of a cold-storage after holding it for two months or over. It seems to me that if more creameries would cater to the winter trade with fine, fresh butter, which commands from 32 to 35 cents per pound, it would be a paying business.

About the only element of discord in the creamery outlook at present, is the bad state of trade in Great Britain. At one time we might have been alarmed at reading: "We in England are able to get plenty of butter from all parts of the world, and do not, at any rate just now, need to consider Canadian for any time." Happily for Canadian creameries our home markets can easily consume practically all our butter, under normal conditions.

The outlook for creameries, then, is very satisfactory from the market end of the business, and we need not worry ourselves in Canada that out of nearly 400,000 packages of butter received in Montreal last year, only a little over 90,000 were exported. It is estimated that the total make of Canadian butter is about 2,000,000 packages, of 56 lbs. each. The fact that we are able to consume this amount of butter yearly speaks well for the gastronomic butter capacity of our people, but when we reduce this to a basis of per head population, it is less than 20 lbs. to each person in a year.

When we consider that butter is the great oil for the brain, and that brain workers are more and more in demand, we need have no fear for the future demand of what is admitted to be a luxury, but a luxury that is becoming more and more a necessity.

The Other Side of the Picture.

He who looks on the rosy side of life is usually welcomed everywhere. The world is looking for optimists, and usually has little use for a pessimist, who has been defined as one who, when given the choice of two evils, selects both. However, we should be unwise did we not consider some of the defects of the creamery business, and thereby pave the way for improvement. Some men pride themselves on being "constructionists" and not "destructionists." But we are admonished, "Not to put new wine into old bottles." Some of the creameries (bottles) are scarcely able to contain the new wine of improvement which is demanded in order to make their butter of first-class quality. Carlyle said of England, that it had a population of about 30,000,000, then added this sententious comment—"mostly fools." We should not care to be guilty of a similar charge against farmers, buttermakers and creamerymen, but these certainly do some things which appear to be foolish. One of the old English poets has this verse:—

> "Counter & Clubb were men in trade whose pains,
> Credit, and prudence brought them constant gains.
> Partners and punctual, every friend agreed
> Counter & Clubb were men to succeed."

We have here the very essence of commercial success: "pains," "credit," "prudence," "partners," "punctual"—who would not succeed under these conditions?

Confucius said: "It is only the supremely wise or the deeply ignorant who never alter." Some men are so "sot" in their ways, that the very idea of "change" is repulsive to them. These men are likely to get left in the race of life, then how lonely they will be. Stevenson said, "It is better to be the slave of the worst tyrant that ever lived than to be nobody's dog."

There are a number of things in connection with the creamery business that to us look as if they could be improved.

Practical Suggestions.

The Farmer's Side of the Question. There is great need of more milk and cream and cheaper production. Most of our creameries are not running to full capacity for more than three months of the year—most of them for not more than one month. This is a loss to the farmer, and to the creameryman. As usual, the burden of the loss is borne by the farmer. The other classes have a facility for shifting burdens onto the back of the patient farmer. Better cows, cheaper and more feed, better stabling, greater skill and care in feeding cows, and in handling milk and cream, are important points which should receive the attention of every creamery patron.

Tainted cream, thin cream not sufficient to make it a paying proposition—these are points which must be considered by every dairy farmer who patronizes a creamery, and these are defects for which the farmer is responsible. During the months of October and November each year the Ontario Agricultural College Creamery reputation is in great danger of being lost,

and certainly receives some very severe jolts, through carelessness on the part of patrons who allow cows to eat turnip tops and who send cream that is impossible to make into fine butter.

Cost of Hauling Cream. Closely associated with the foregoing is the question of hauling cream. In our own creamery, where cream collectors are paid from $3.50 to $4 per day, we find that the cost of hauling cream during the season of 1908 (April to November inclusive) varied by months from 1.56 cents per lb. fat (June) to 3.3 in November, and 3.64 in April, on one route; from 1.39 cents to 3.67c. on another route; and from 1,31 cents to 1.85 cents on another. The average cost of hauling per lb. fat for the season was 2.1 cents, 1.9 and 1.5 cents, respectively, on the three routes.

The total monthly delivery in pounds of fat varied from 817 (April) to 2,307 (June) lbs. on the first route, making a total of 12,000 lbs. fat in round numbers for the eight months; on the second route the total pounds fat delivered monthly ranged from 762 to 2,582, and totalled 11,500 for the month. On the third route the monthly deliveries ranged from 1,698 lbs. to 3,772 lbs. fat, totalling 21,711 lbs. fat for the season.

The point I wish to emphasize is, that the cost of hauling is very much increased with a small supply of cream. In our case, in the months of April and November, the amount of cream delivered cost us practically all that we received for manufacturing (4c. per lb. fat), in the months of June and July the cost per pound of fat was about one and one-half cents per pound. For the whole season the cost of hauling was practically 2c. per lb. fat (1.927c.).

How to get the cream to the creamery more frequently and not increase the cost of hauling, is a problem which ought to receive very careful consideration by both farmers and creamerymen. We have wondered if electric railways and some form of automobile cream wagon, where roads are fair, might not help to solve the problem.

Cheese vs. Butter as Profit Producers.

While the creamery patrons may have been dissatisfied to some extent, and thought they ought to have received better prices; and while some creamerymen may have been anxious because of this dissatisfaction on the part of the patrons, they may have this consolation, that patrons of creameries during 1908 probably received greater returns than did those who patronised cheeseries, if the results at the Ontario Agricultural College may be taken as a criterion.

By way of explanation, regarding the table which follows, we may say that milk was hauled and cheese made at a charge of 1½ cents per pound. Those who delivered their own milk were charged one cent per pound of cheese for making.

In the creamery branch, cream was collected and made into butter at a charge of four cents per pound of fat. Those who delivered their own cream were charged three cents per pound fat. The table shows the relative returns by months to both cheese and butter patrons on the basis of the fat delivered, which, while not a correct basis, is possibly the best for the purpose.

AVERAGE PRICE PER LB. FAT PAID TO CHEESE PATRONS.

Month.	Lbs. fat.	Paid patrons.	Average price per lb. fat.	Cheese made lbs.	Selling price.	Lbs. milk per lbs. cheese.
		$ c.	c.		c.	
April	873.82	208 43	23.85	2,093	11.37	10 96
May	974.29	241 63	24.80	2,401	11.5	10 97
June	1,202.11	331 02	27.53	3,221.5	11.65	10 44
July	836.76	237 65	28.40	2,171.75	12.3	10 97
August	687.58	195 99	28.50	1,773	12.5	10 67
September	631.57	180 92	28.65	1,638	12.5	10 47
October	562.41	145 03	25.87	1,348.5	12.15	9 94
November	265.88	64 66	24.32	608	12.08	9 92
	6,034.42	1,605 33	26.60	15,254.25	.....	.....

Average selling price of cheese for season, 11.93 cents.

AVERAGE PRICE PER LB. FAT PAID TO CREAMERY PATRONS.

Month.	Lbs. fat.	Paid Patrons.	Average price per lb. fat.	Lbs. butter.	Average selling price.
		$ c.	c.		c.
April	3,633 57	1,210 75	33.33	4,106	32
May	5,320 17	1,541 20	28.87	6,128	27.6
June	10,688 87	2,429 65	22.6	12,403	22.5
July	9,358 07	2,243 29	23.8	10,926	23.5
August	9,145 97	2,396 34	26	10,833	25
September	8,597 33	2,284 85	26.4	10,307	25
October	6,216 82	1,761 78	28.2	7,403	27
November	4,329 78	1,331 17	30.6	5,137	29
	57,290.58	15,199 03	26.53	67,243	.....

Average selling price of butter for season, 25.53 cents.

As we practically must have a certain amount of milk for cheesemaking during the year for educational and experimental purposes, when we lost in the spring some cheese patrons, and saw that we were likely to lose others, owing to the relatively lower price received for cheese compared with butter, we said to them: "If you will continue to send milk to the cheese room for the entire season, we will make up to you any difference there may be, between the price paid to our butter patrons and that which you receive, and in addition we will pay you 15 cents per 100 lbs. whole milk, in lieu of the skim-milk."

You will observe by the table that the average price received per lb. fat by the cheese patrons was 26.6 cents per lb., while the butter patrons received an average of 26.53 cents—or practically the same as the cheese patrons were paid, while the latter had in addition the skim-milk. What we had to make up to the cheese patrons was practically the value of the skim-milk. This amounted to $133.75 on about 103,000 lbs. whole milk. The amount of money per cheese patron which we had to pay as a bonus varied from $7.80 to $55.73. The latter patron delivered 40,650 lbs. milk, so in his case it was quite an item.

Conclusions.

In order to make the creamery outlook even more promising, we need among other things:

1. More Education. An American creamery man, dealing recently with the question of education for the buttermaker, said: "The guardian genius of democracy is always the cultivated mind. It is the only dictator that free men acknowledge, and the only security that freemen desire." Our farmers, cream-haulers, buttermakers, creamerymen—yea, we all—need more education.

2. We Need Better Dairy Legislation. While it is true that you cannot make a man honest, or a good farmer, or a capable cream hauler, or a first-class buttermaker by Act of Parliament, yet a great deal can be done by our legislators to assist in these things.

As an example of what seems to us a lack of knowledge in dairy legislation, we may cite a couple of clauses from recent dairy Acts: "All milk containing less than thirteen per cent. of total solids, of which three and three-quarters per cent. must be chemically dry butter-fat, shall be deemed below the standard required in creameries for butter manufacture." With all due respect to the framer of the Act, we trust that we may be allowed to observe that this is out of date. What have the "total solids" of milk, other than the fat, to do with milk for buttermaking? Would not milk containing 3 to 3½ per cent. fat make good butter? Why "chemically dry butter-fat?" Would not fat determined with the Babcock tester be all right for buttermaking? This clause in the Act was framed twenty years ago, and should now be dropped.

The second citation is with reference to the legal definition of a Creamery We read "Creamery means a place where the milk or cream of not less than fifty cows is manufactured into butter." Now if we understand the meaning of creamery, the fundamental idea contained in it is *co-operation*. Where two or more persons join together for the purpose of making butter, such a place is a "creamery." The number of cows has little or nothing to do with it.

3. Pasteurization. The last need we shall mention is, Pasteurization. This we consider to be one of the greatest practical needs for a steady improvement in the quality of butter. It will not do everything, but it will go a long way towards lessening the output of poor butter.

Education, Legislation, Pasteurization—these three, but the greatest of these is Education.

A GENERAL SURVEY OF THE DAIRY INDUSTRY FROM A CANADIAN STANDPOINT.

By J. A. Ruddick, Dairy and Cold Storage Commisioner

When considering a choice of subjects for an address at this convention, it occurred to me that "A General Survey of the Dairy Industry from a Canadian Standpoint" should be of interest, in view of the important developments which are now taking place in various parts of the dairy world, some of which may have a very decided influence on the future of the Canadian dairy industry. We must keep our eyes open to what is going on around us and study the march of progress in other countries if we would be fully prepared to face the competition which we are likely to meet in the

world's markets. In these days of rapid and safe transportation the four corners of the earth are brought into direct contact, and distance and cost of carriage no longer stand as obstacles in the way of the free movement of dairy produce from one point to another in times of local scarcity or over supply. Anyone who would have suggested sending Canadian butter to Australia or bringing it to Canada from New Zealand or Siberia, would have been considered mad not so very long ago; and yet, that is what has actually been done during the last year or two. Extended commercial organization is also a factor in promoting the trade in butter and cheese between different countries, and we have amongst us representatives of houses whose ramifications extend from that great centre of consumption, Great Britain, to every important field of production in the world.

One of the notable features of the dairy produce trade during the past ten years, has been the large increase in butter consumption in Great Britain and in Germany. A few years ago Germany was an exporter of butter to a large extent; but that is a thing of the past. The improved condition of the industrial classes in Germany enables many of the people to use butter who a few years ago did not know the taste of it. This increased home demand has absorbed the whole production of the country and calls for a large importation from abroad. The annual importation of butter into Germany now amounts to something like 100,000,000 pounds, which comes principally from Denmark, Holland and Russia. If we are to take any note of competition or the absence of it, we must recognize that this Germany demand is of real interest to us, because, lacking that outlet, practically all the butter which now goes there would be dumped into England, with what result it is hard to say; but it certainly would not improve the tone of the market. It is true that our export of butter to England has grown so small as to cease to be of much importance in itself; but I look upon butter and cheese as so closely related that they should always be considered together. Conditions of production are such in many places that an over production and reduced price of one article immediately result in an increased production of the other.

Looking over the field of international trade in butter, the first point to note is that the consumption of butter in Great Britain—which country is by far the largest importer of this product—has increased at a very rapid rate for some years past. The imports for the year ending June 30th, 1908, exceeded those of 1899 by 81,753,520 pounds, and as the home production in Great Britain does not change much from year to year, this large increase may be attributed to increased consumption. As for the exports by countries, we are naturally attracted first to Denmark, with an annual export of about 200,000,000 pounds, and nearly double that of any other country. The story of Denmark's butter trade is so familiar that it needs no more than passing mention, especially as there is no evidence to show that there will be much change in the volume of Danish exports in the immediate future. The Russian or Siberian export of butter is now easily second to Danish in volume, and it is growing rapidly; but I shall refer to it later on. Australia in times of plenty, that is to say when there is sufficient rain, ranks third in the list; but the supply of butter from the Commonwealth will always be a little uncertain because of weather conditions. For instance, in 1902 Australia exported only 7,777,971 pounds of butter, owing to the prolonged drought; but such are the marvellous recuperative powers of the country that in 1904, after good rainfall, the quantity had risen to 64,788,-542 pounds. Holland takes fourth place with a steady export of about

50,000,000 pounds a year. As the Dutch co-operative associations, when they build a new creamery, borrow the money and arrange the payments to cover a period of fifty years, it would seem to be a reasonable inference that they intend to keep right on making butter. History tells us that it takes strong influences to swerve the Dutch from a course which they have once decided upon.

New Zealand, Finland, France, and Sweden each export between 30,000,000 and 40,000,000 pounds a year; but New Zealand is probably the only one of these countries which is likely to show an increase in the future. Nor is it probable that there will be much change in either direction in the older countries.

At one time we were told that Argentina was the coming country in the butter trade; but the arrival seems to have been delayed. As a matter of fact, there has been no increase in the shipments of Argentine butter since 1902, and those who know the country, while admitting its suitability for dairying, say that the present inhabitants will never become dairymen on a large scale.

Possibly the most interesting, because it promises to be the most serious competition which some countries will have to meet, comes from Siberia. The building of the Trans-Siberian Railway has opened up an enormous territory which is apparently better suited for live stock industries than for other lines of farming. Owing to the existence of numerous navigable waterways which cross the railway at right angles and act as feeders to it both from the north and from the south, the extent of country which has been given communication is many times greater than would ordinarily be served by a single line of rails.

The first butter was exported from Siberia in 1894, and the quantity was only 14,400 pounds. The principal growth has been in quite recent years. The development of Siberia as a dairying country is due to the remarkable migration of peasants from European Russia. The *Pall Mall Gazette* of London is my authority for the following figures: "Up to the end of 1905 the average annual migration across the Urals was about 60,000 persons. In 1906 this number was increased to 180,000; in 1907 the total was nearly 500,000; while in the first three months of 1908 70,000 families, or approximately 420,000 persons settled in Siberia." If you imagine the present settlement of the prairie provinces of Canada as progressing at two or three times the present rate, you will have some idea of what is going on in Siberia.

In one respect the Siberian competition is not as serious as it might be, for in spite of the skill of Danish buttermakers, who are largely employed, the quality of the great bulk of the product is only second grade, owing to the unsanitary conditions under which the milk is produced. The people are extremely poor, with primitive surroundings, and a high standard of cleanliness is not to be expected in such circumstances. On the other hand, these very conditions will permit the Siberian farmer to continue the production of butter at a rate which would be ruinous to Canadian or other English speaking farmers with their higher scale of living. Our safety lies in bringing to our dairy operations the advantages which a more advanced civilization gives us in producing a superior article, and increasing the flow of milk by improving our dairy herds.

Turning now to the cheese branch of the dairy industry, we are confronted with another set of conditions. In the first place, the total consumption of cheese in Great Britain, almost our sole market abroad, has not permanently

increased in ten years, nor is there any evidence that it will do so in the future. Our chief hope for increased outlet at present prices, apart from what may be gained by improved quality, seems to lie in the encouragement of a larger consumption in Canada, in which direction there are greater possibilities than are generally supposed. Canadians take some pride in the fact that they are by far the largest exporters of cheese in the world. The country next in the list, which is Holland, has a little over half as much to her credit; or, in other words, Canada will this year export about 170,000,000 pounds of cheese, while the Dutch exports are only 100,000,000. Moreover, only about one-third of Holland's trade is with England. Add to this the fact that the Dutch cheese are of a different variety from ours, and go largely to markets for which our cheese are not suited, and it will be seen that the competition either directly or indirectly is not as keen as it would be if the cheese were of the same kind as ours.

Switzerland is the next largest cheese exporting country; but as only a very small percentage of the Swiss cheese reaches the British market and the whole of it is different in character from the Canadian, we need not concern ourselves very much with it at present.

The Italian export, consisting largely of Gorgonzola cheese, follows next in the order of quantity. Although the Italian output seems to be increasing somewhat, it does not, on account of its character, compete directly with Canadian. It would be a mistake, however, to assume that there is no competition between cheese of different varieties, or that one kind is not often substituted for another.

The United States, although still the greatest cheese producing country in the world, and at one time Canada's most formidable rival in the British market, has ceased to be a factor in the international trade in cheese, because practically the whole output is required for home consumption.

The English and Scotch cheese, consisting chiefly of Cheddar or allied varieties, though not exported, is for that very reason of great importance in the British market, especially as the quantity produced far exceeds the Canadian output or that of any other country except the United States. There are no accurate statistics of the production of cheese in Great Britain, but it is estimated to be at least 300,000,000 pounds a year.

Last, but not least, we have to consider a country which is reaching out for a share of England's cheese trade with an aggressiveness, and with a measure of success, which should cause Canadian dairymen to do some thinking. I refer to New Zealand, our only direct competitor of any consequence, if we do not include the Old Country itself. New Zealand cheese are of the same type as ours, and the cheesemakers receive their instructions from a Canadian teacher. Previous to 1906 the production of cheese in New Zealand had not shown any permanent increase in ten years; but since that year there has been a remarkable expansion, and the present season's output, which is expected to be at least 400,000 boxes, or probably 35,000,000 pounds, will be about three times as large as that of 1906. This sudden growth is due largely to the fact that the combined factories have turned their milk into cheese instead of butter, owing to the higher returns from cheesemaking. Should the relative price of butter and cheese be reversed, the production of cheese will fall back to the old level; but if the market continues as it has been lately, there will be a considerable increase in the quantity of cheese manufactured for some time to come. It is hard to say how much it may increase, because the country is capable of producing an

enormous quantity of dairy produce, and large areas are not well adapted for anything elese. Fortunately for us, dairying is not popular among the settlers; they prefer sheep farming as an ocupation. Dairying is, however, the most profitable branch of farming on small holdings in New Zealand.

While the quantity of New Zealand cheese is not yet large enough to prove a very serious menace in view of our decreased shipments, there are some features of this competition which should command our attention. In the first place the New Zealand cheese factories are larger than ours, some of them making as high as 140 cheese a day. This tends to give the output a uniformity of character and quality which cannot be so easily attained in small factories. In the second place the cheese are all practically cool-cured, because the weather is never as hot as it is here in Canada. Owing to the distance from the market, the cheese are at least two months old before they reach the consumer, and as they have to cross the equator in transit, they must be carried in cool storage, which ensures their delivery in cool condition. Moreover, as they land in England only during cool weather, they do not suffer from exposure to heat after reaching the market as ours sometimes do. It is generally understood, I suppose, that the New Zealand season is exactly opposite ours. Their summer is our winter. The season there is longer than it is in Canada, owing to the absence of any real winter, so that the first of the season's make arrives about the beginning of December, continuing all through the winter until the month of June.

Now, here is where the most serious part of the competition comes in. The supply of Canadian cheese during the manufacturing season exceeds the demand, as everyone knows, and British merchants stock up with the surplus against the period of non-production. When the Canadian cheese was practically the only cheese of its kind being imported, they were obliged to do this or go without. But with the New Zealand supply in view, the merchant is not so keen in placing his orders, especially if the quality of the Canadian cheese does not suit his fancy, or if he thinks the price is too high.

In this way the New Zealand cheese have a sentimental as well as a material effect on the market, out of proportion to the quantity offered.

Drawing on my personal knowledge of conditions in New Zealand as well as in Canada, I would say that the alarm expressed in some quarters concerning the New Zealand competition may yet be justified if Canadians do not make the best use of their opportunities. First and always I would urge every factory to provide for the cool-curing of their cheese. The presence on the market of so many cool-cured cheese from New Zealand will emphasize the superiority of mild flavored cheese. I cannot go into the question of cool-curing now, nor would it appear to be necessary. There are a sufficient number of cool-curing rooms in Western Ontario to furnish evidence of advantages to be derived from them, and if any one wishes to know the experience of those who have them, he need only make enquiries. I would like to impress this point, however: when estimating the benefit to be derived from cool-curing, do not forget to take into account the important effect it will have on the future of the industry. Perhaps I should add that I am still ready to furnish plans and specifications to all who may want to make use of them.

To finish this general or foreign part of our survey of the dairy industry, I submit the following tables of the exports of butter and cheese from various countries, compiled in part from the Year Book of the United States Department of Agriculture and partly from other sources.

TABLE I. INTERNATIONAL TRADE IN BUTTER.

Country.	1906.		Country.	1906.	
	Exports. Lbs.	Imports. Lbs.		Exports. Lbs.	Imports. Lbs.
Denmark	175,043,639	13,049,158	Argentina	9,712,076	
Russia (Siberia)	114,369,238	577,805	Austria-Hungary	7,740,648	
Australia	75,765,536	70,143	Belgium	3,704,232	11,128,520
Holland	56,404,861	563,865	Norway	3,281,403	
France	39,307,325	11,402,808	Brazil		5,344,412
New Zealand	35,865,200		South Africa		11,555,202
Sweden	35,712,817	1,316,117	Germany		80,896,179
Finland	33,192,114		Great Britain		477,092,448
Canada	18,243,740		Other countries	4,677,661	
United States	12,544,777				
Italy	10,746,430		Total	636,311,697	612,996,657

TABLE II. INTERNATIONAL TRADE IN CHEESE.

EXPORTS, 1906.

Country.	Variety of Cheese.	Pounds.	Country.	Variety of Cheese.	Pounds.
Canada	Cheddar	200,824,470	Bulgaria	Various	6,606,741
Holland	Edam & Gouda	104,742,665	Germany	"	2,629,673
Switzerland	Gruyere	61,935,107	Russia	"	1,733,414
Italy	Gorgonzola	42,314,633	Other countries	"	9,111,773
France	Soft varieties	22,058,487			
United States	Cheddar	17,285,230	Total		483,937,265
New Zealand	"	14,695,072			

IMPORTS, 1906.

Country.	Pounds.	Country.	Pounds.
Argentina	7,304,669	France	44,714,972
Australia	304,951	Germany	48,187,525
Austria-Hungary	8,935,994	Italy	10,398,761
Belgium	30,333,690	Spain	4,255,835
Brazil	3,784,774	Switzerland	5,541,979
South Africa	3,228,593	Great Britain	289,371,824
Cuba	4,078,517	United States	33,848,766
Denmark	1,782,437		
Egypt	10,064,909	Total	506,138,196

These figures will serve as a comparison. I have not been able to get complete statistics of years later than 1906. As far as cheese is concerned, the only countries in which there has been any material change in 1907 and 1908 are Canada, United States and New Zealand, the two former showing a decrease and the latter an increase, as we have already indicated. With respect to butter, Siberian exports have been largely increased. Australian increased in 1907, but fell off again in 1908. New Zealand and Canadian

exports have also decreased. Of course it will be understood that the exports of a country do not bear any regular relation to production. That depends on home consumption, as we have seen in the case of Great Britain and of the United States. I have given you the export figures, because the others are not available and would not be so interesting or instructive if they were.

Having completed this somewhat rapid survey of the international trade in butter and cheese, I ask your attention now for a moment to some aspects of the industry in Canada.

Our exports of butter reached the maximum of 34,128,944 pounds in 1903, and then declined to less than 4,000,000 pounds in 1907. The figures for 1908 will show an increase of probably one and a half million pounds over 1907.

Canadian cheese exports reached the maximum of 233,980,716 pounds in 1904, and they also have declined. It is estimated that the exports for the season of 1908 will not be over 170,000,000 pounds, making a total shrinkage of nearly 800,000 boxes, of 80 pounds each, since 1904.

This rather startling decrease in the export of Canadian dairy produce has been looked upon in some quarters as an actual decline of the industry in this country. I do not think that view of the matter is justified if we consider all the facts which bear on the question. In the first place the seasons of 1907 and 1908 were extremely unfavorable for the production of milk in the principal dairying districts, while on the other hand the seasons of 1903 and 1904 were quite the reverse. The increase in the condensed milk industry has also had an appreciable effect on cheese and butter production, but the main reason for the decrease in the exports is to be found in the increased home consumption.

As it appears to me, there are three factors which have contributed to this increase. First, there is the growth of population. There are probably 1,000,000 more people in Canada at the present moment than there were in 1904. I should say that that number of people would consume at least 20,000,000 pounds of butter, and milk and cheese equal to another ten million pounds. Then there is the increased purchasing power of the people as a whole, which permits them to spread the butter more thickly and to indulge to a greater extent in the use of cream, ice cream and other milk products. Last, but probably not least, the improvement in the quality of butter has encouraged a tremendous increase in its general consumption. Taking all three factors together, I think it is safe to say the falling off in exports is fully equalled by the increase in home consumption.

I see no reason whatever to deplore the fact of our decreased exports. On the contrary, we have every reason to congratulate ourselves that we have found another outlet in the enlarged home market. It must be apparent to anyone who has given the matter a thought, that if we had continued to ship as much cheese of the same quality to Great Britain as we did in 1904, the market would have been overdone and more or less demoralized. In any case, the present level of prices could hardly have been maintained. The lesson for us is that we should give more attention to our home trade, which has always been of more importance than we have generally recognized. I have only to state that we consume in Canada in the shape of milk, butter, cheese and condensed milk over two-thirds of our total dairy production, to prove how important it is, and in doing so I submit a fact which has been generally overlooked. We can, I believe, increase the consumption of cheese in Canada to a large extent by giving it to the people in convenient form, of the right character and quality and properly matured. There is an enormous demand for cheese in Canada which is not satisfied.

By improving the quality and lessening the proportion of heated, strong flavored cheese, the consumption would be increased in Great Britain also.

I do not want anyone to think that I regard the Old Country market as unable to take a larger quantity of our butter and cheese than it did last year. I believe there might be a much larger share of Great Britain's requirements in dairy produce supplied by Canada if we are careful to send them the right quality, and the kind which will encourage consumption. We have this satisfaction, that the Old Country will give us the preference over continental countries, everything else being equal.

There is no reason why there should not be a large expansion of the dairy industry in every province of Canada as well as in Ontario. I hope the movement for the improvement of dairy herds will help in that direction, even if new territory is not opened up.

Perhaps one of the best arguments that can be used in favor of dairying as a profitable branch of farming is to point to those districts or counties where it has been most extensively followed, for there you will find the most prosperous farming communities.

THE KEEPING QUALITIES OF BUTTER.

By Prof. S. F. Edwards, O.A.C., Guelph.

The problem of the keeping quality of butter is one of interest to every buttermaker. We know that butter made from ordinary unpasteurized cream without a starter is very short lived. We know that pasteurized cream ripened with a good starter is greatly superior in keeping quality. Experimental work in the dairy at the Ontario Agricultural College pointed to the conclusion that butter made from pasteurized sweet cream kept best of all. It has been commonly supposed that salt in some way conferred better keeping quality, although recent investigations throw considerable doubt upon this point, the salt appearing in some cases to hasten the deterioration of the butter, rather than enhance its keeping quality.

The problem is largely a bacteriologic one. Up to about a year ago, however, very little reliable work has been done in America in a study of the microscopic life which is present in butter until it has become unusually rancid, and of successive stages in the decomposition which render it unfit for use. In Europe, where most has been done along this line, the conditions are so radically different as to make much of the work done of scarcely any practical value to us. Little, if any, of the European work has had to do with actual cold storage and the conditions obtaining at temperatures below zero centigrade, and those above freezing point are so far from parallel, and the changes which may take place are so diverse, as not to allow of ready comparison.

During the past year, technical studies of this problem have been in progress at the Michigan Agricultural Experiment Station, and inasmuch as the dairy conditions in Michigan and Ontario are more or less similar, I shall review briefly the results obtained thus far in the investigations at that station.

The importance of such research to dairy interests at large is hardly to be over estimated. It is, of course, not to be expected that a butter which has been kept for some weeks or months will retain all the delicate bloom and aroma so characteristic of perfectly fresh butter made according to the best known methods. Some butters do, however, come out of storage after several

months with a better flavor than other perfectly fresh butters which have not been so carefully made. Certain butters may even come out of storage better than when placed in. Again, two lots when received may score alike and, though kept under identical conditions, one lot may come out in excellent condition while the other may have deteriorated to such an extent as to render it entirely unsalable.

The purpose of the work at the Michigan station was to obtain a general view of the changes in cold storage butter, with a view to making further and more detailed studies of the problem.

From a review of the work of various European and American investigators, the following conclusions are drawn:—

"The term 'rancid' is not definitely fixed. Very probably there are different chemical compounds in different rancid butters. Free butyric acid certainly causes a rancid taste in butter, but its amount is not always high enough to cause an off-flavor. The rancidity of butter is almost certainly due to micro-organisms, some of which effect a decomposition, for butter sterilized by heat will keep indefinitely if kept from micro-organisms, light and air. The rancidity cannot be due to a fat decomposing ferment originally present in the milk, because if so, the butter from pasteurized or sterilized cream should keep; whereas, it spoils in the same way as ordinary butter, though usually much more slowly.

"All investigations show that the spoiling of butter is a process requiring the presence of air, beginning at the outside and slowly penetrating through the whole butter. A number of instances are on record of the finding of butter which had evidently been buried in bog water for centuries, in one case a sample of about twenty pounds having been submitted to the ordinary chemical determinations after its recovery. That under these conditions decomposition would take place very slowly indeed is not surprising, since these fatty acids are very difficultly decomposed in the absence of air."

Outline of the Work at the Michigan Station.

Samples were obtained during May and June by different members of the bacteriological staff, who personally observed the methods of manufacture, creamery conditions, surroundings, and everything which might affect the finished product—temperature of cream and wash water used, source of the water and ice, methods of obtaining and handling cream, personality of buttermaker, etc. Tub lots were secured from as many creameries as possible in the dairy sections of the State, seven sixty-pound tubs being ordinarily taken from a single churning at each place visited. These tubs were immediately tagged and shipped at once by express to the bacteriological laboratory at East Lansing.

The Score. Immediately upon receipt of the butter at the laboratory cold storage, the samples were scored by a dairy expert. Particular attention was given to flavor, texture, moisture and salt.

Storage. After the desired laboratory samples had been taken and the butter had been scored, each sample lot was divided as follows: The broken tub was kept at the station cold storage at the temperature of 38°-42° Fah. Of the six remaining tubs, two were shipped to each of three different cold storage plants subject to withdrawal as required for sampling.

About the first of November, one tub from each lot was scored at the storage warehouse where it had been kept, after which the scored tubs were brought to the local cold storage and sampled for the laboratory as required. At this time seventy-two tubs were examined at the rate of four a day. As soon as the samples had all been obtained, the sampled tubs were set out

without regard to order or place of storage, and scored again by a second expert butter scorer, the tubs being known only by number. The tubs were then disposed of, the duplicate samples being retained in the various places of cold storage for the later examination. On the first of February, the remaining tubs of butter were withdrawn from storage and examined as before. As the ordinary temperature was low at this time, the tubs were all assembled at the college cold storage for sampling and scoring.

Disposal of Butter. Since the sale of the butter used in these tests may be of interest, it is given here. The first lot was sent to New York in February and was priced as follows: One tub at 27 cents; six tubs at 25 cents; twenty-three tubs at 23 cents; thirteen tubs at 19 cents.

Of the second lot, that sent to New York arrived on a dull market and was sold in one lot, fifty-three tubs at 18 cents, which was one-half cent less per pound than ten tubs bought at a renovating establishment at this time, although this latter lot was withheld from shipment as being much inferior to the other. The average score for February was two and one-quarter points lower than in November, the two scores being 89½ and 87¼, respectively.

Extensive bacteriological and chemical investigations were conducted, and the various lots of butter were scored at the beginning of the work during November, and again in the following February.

Observations were made upon various factors influencing the scores as follows:

Effect of Temperature. "With few exceptions all the samples of butter kept in the college storage where the temperature was above the freezing point—about 40° Fah.—had become entirely unfit for ordinary use before November. Of the eight best samples, the highest score at this time was 88 and the lowest 75, the average being 78.6. These samples were in most cases very rancid, but no other flavors were noted except that of moldiness.

"Results of observations with regard to the effect of water content tended to show that this factor did not affect the score. Although the salt content of the samples varied between 1.06 per cent. and 3.78 per cent., no difference in keeping quality was apparent as due to this single factor, the scores of the high salted and low salted samples approximating each other very closely."

Effect of Starter. "The use of a starter in preparing the cream for churning appears to have had a decided influence upon the scores, for, without a single exception, the average scores of the eight lots where a pure culture was not used are lower than the averages of eight lots where a commercial pure culture starter was employed.

"In the bacteriological work, there were isolated in all 879 pure cultures, belonging to six different groups of organisms and including molds, yeasts, and bacteria. A total of 87 different species of organisms were found in the butter, most of them only once or twice."

The origin of bacteria in butter is not always the same. Several kinds are the regular inhabitants of milk, some of them being able to break up the fats of butter, thereby causing rancidity. These organisms may be prevented from causing trouble by pasteurization of the cream before the ripening with pure culture starter.

Other bacteria are derived from the wash water. The Iowa Experiment Station found a direct relation between the bacterial content of wash water and the keeping quality of butter. This conclusion was confirmed later by

the Kansas Experiment Station. These bacteria may be kept out by pasteurizing the water to be used for wash water, cooling and using it immediately to prevent recontamination from the air of the factory.

Molds and yeasts are the regular habitants of the air of all rooms, on the walls of storing rooms as well as on the utensils.

The Michigan investigators do not attempt to draw final conclusions on the keeping quality of butter, but only to define the factory scientific problems furnished by the cold storage of butter, with a view to settling these problems by further research.

The creamery problems indicated are the improving of the quality of cream, the advisability of pasteurization, the use of ripened or sweet cream, and the salting and packing.

"We must first learn what micro-organisms are able to cause the rancidity of butter, then trace their origin, and lastly learn how to keep these organisms from the butter; or if this should prove to be practically impossible, how to avoid their development in butter. The only two means we have at present are salt and the effect of temperature. Low temperature entirely checks the growth of many organisms, and other species develop only very slowly. Salt decreases the rapidity of multiplication very much and may kill many cells. On the other hand, others are able to multiply even in concentrated brine. It is questionable whether or not the combined action of salt and low temperature is desirable, since the salt tends to lower the freezing point considerably. This, too, is a problem demanding further investigation before we can draw final conclusions."

INTRODUCTION OF THE NEW PRESIDENT.

The CHAIRMAN: In retiring from the position of President of this Association, I desire to thank the members of the Board of Directors for the courteous manner in which they have assisted me during the time I have been on the Board of Directors, and to wish the Western Dairymen's Association greater prosperity during the coming year. Allow me to introduce to you the President-elect of the Dairymen's Association of Western Ontario for the year 1909.

Mr. J. J. PARSONS, President-elect: It would be altogether out of place on my part to make a speech on this occasion, because I did not come here prepared to give one. If I did, it would be presumption on my part that I was going to be elected to this office, and I assure you I had not the slightest hopes of that until just recently. I want to thank the members of this Association and the officers for the honor that they have conferred upon me in electing me to the position of President for the ensuing year. I feel that it is a great honor. I little dreamt when first elected to the Board of Directors that it would result in my being President of this Association. It will be my earnest endeavor, if spared, to occupy the position, to do all in my power to continue the good work of the Association, because we must all admit that the work done by this Association has been marked all along the way by progress. I feel satisfied that, with the assistance of the Board of Directors elected to work with me, and with our Secretary, that I will have all the help that I require. I trust that for the present session those in attendance will listen with pleasure and interest and profit to the addresses that are to be given, and that you will all assist me in maintaining order. Mr. Parsons then took the chair and conducted the further proceedings of the evening.

ADDRESS.

By Lloyd Harris, M.P., Brantford.

The Mayor has welcomed you to our city, and I want to add to the words that have been spoken my appreciation of your having chosen Brantford as the place of your Convention this year. I hope so large and important a body as the Western Dairymen's Association will not come to our city with the intention of devoting their time to discussing dairy interests alone. I think you might spend some of your time in learning something about the industries we have here in our city. In Brantford, we are largely engaged in manufacturing. We have built up a city which is renowned from one end of the Dominion to the other, and in foreign countries, as a manufacturing centre. The large proportion of our maunfactories are agricultural implements, and we cannot make first-class agricultural implements unless we know something about the conditions under which these implements have got to be used. Therefore, we have to be in fairly close touch with agriculture.

I do not think dairying is an agricultural pursuit. I have always classed it as a manufacturing pursuit. You are endeavoring to produce milk at the lowest possible cost, and sell it at the highest possible price, either in its raw or its manufactured state.

I think I might class the bacon industry with the dairy industry. We are all delighted with the progress that has been made with the dairying industry in Canada. I do not think any one branch of agriculture has shown a more marked progress and prosperity than the dairy industry. When we look back upon what has been accomplished in the last ten or fifteen years, the figures which we have are simply stupendous. This great progress is almost entirely due to the fact that the Governments in this country have branched out in technical education for agriculture. The Government of the Province of Ontario has founded what is perhaps the most splendidly equipped institution in the world for the purpose of teaching the different branches of agriculture, with the result that the Agricultural College has turned out men and women who have been sent to different parts of Canada equipped with knowledge and information whereby they have been able to manufacture the product of milk into a better quality of butter and cheese, with the result that the increase in the wealth of this country has been enormous.

I think we ought to go still further. I have this question of technical education on my heart, and I am always glad to express my views on this question with the idea that perhaps others will get some views that I have, and recognize the great importance of technical education in this country, and do all they possibly can in the position they occupy to further this matter.

I would like to see the Government study this great question of technical education and get the greatest possible information they can. I would like to see a Royal Commission appointed, and I think the Dominion Government should take the initiative in getting information together. Let this Royal Commission enquire in the different countries of the world the condition in which the different industries of these countries are carried on, and find out if they have better agricultural training than we have in Canada, and bring the information back to us. I want agriculturists to assist us, and give us their co-operation and support in getting this information for the purpose of building up technical education, not only for agriculture and for artisans and other branches of industry, but that we may produce men in

this country of ours who will be able to cope with the great problem before us in developing the wonderful natural resources that we have.

Great progress has been made in the production of milk. I was reading last week that one of the speakers at the Eastern Dairymen's Association had said that he had carried on experiments to such an extent that he had been successful in getting the cost of keeping a cow for one month down to the sum of $2. That is a wonderful thing when we come to think of it. I do not know what the average farmer of Brant county pays to keep a cow for one month, but I think it is a great deal higher than $2. If the farmers could get that cost down to $2, think of all the increase of wealth it means in dairying operations. Dairying operations are only limited by the number of cows that can be milked on each farm. I was a farmer myself a few years ago. I thought I would like to have a large farm, and the largest herd of dairy cattle in the country. I bought a farm of nearly 1,000 acres, and the next thing I did was to put 400 dairy cattle on that farm. I wonder if anybody knows what it means to milk 400 cows?

The one reason we had to give up the dairy operations at Bow Park farm was the difficulty in getting the cows milked. I had been living in Europe before that time, and I had become interested in the development of a machine that was being perfected in Scotland for milking cows. They claimed that it could be put into practical operation, and I had enough confidence in it to give them an order to send out the apparatus to Canada, and I stipulated the condition that if it didn't work right I would not have to pay for it. I never paid for it. However, I understand that in recent years this machine has been perfected, and if it is, I think it is going to be one of the greatest aids to the dairy industry that has ever been invented. I am greatly in hopes that something will be done whereby this very difficult problem will be worked out to the satisfaction of all of us.

I do not propose to take up any more of your time. I simply wish to thank you again for your courtesy in inviting me here, and I hope your deliberations will result in a very great deal of profit to your Association, and that it will not be very many years before we see you back in Brantford. (Applause.)

The CHAIRMAN: I now have much pleasure in calling upon Prof. Ruddick to make the presentation of these trophies to the winner.

J. A. RUDDICK: It is a very pleasant duty I have to perform in presenting these magnificent prizes to the winner. It may be worth while to explain the nature of this presentation to some of you who may not happen to be familiar with it.

The large cup is a trophy which has been presented by the cheese buyers of Western Ontario, to become the property of the person winning it three times or twice in succession. It has been won already by Frank Boyes, R. H. Green, Oscar Schweitzer, Jas. Paton, J. E. Stedelbauer, and Miss Mary Morrison. This year the winner is T. J. Donnelly, of Union Factory, Elgin county.

The small cup is presented by Mr. Henderson, Manager of the Windsor Salt Co., and it becomes the property of the winner. Mr. Henderson has been very kind, indeed, in presenting prizes, not only for this Association, but to the Eastern Association, and in many ways contributing to the success of these meetings, I think the dairymen owe a great deal to Mr. Henderson for his kindness in that respect.

The J. B. Ford Co., of Wyandotte, present this fine set of carvers to the exhibitor showing the best finished exhibit of cheese, and it so happens that Mr. Donnelly takes that prize. Mr. Donnelly, I have very much pleasure in presenting to you these beautiful trophies. I am sure it must be a satis-

faction to you after your hard summer's work, because I know enough about cheesemaking to know that it does take hard work to win such success as you have. I think you are to be congratulated most heartily for having been so successful, and I trust you will be able to repeat your success and win this cup next year, and become the owner.

These exhibitions, such as you have here, are certainly productive of a great deal of good, and I would like to see the work extended considerably. There is a great educational feature in connection with such competitions, which is bound to reflect beneficially on the industry in which you are engaged. I have very much pleasure in presenting you with these trophies. I congratulate you. (Applause.)

Mr. DONNELLY: I assure you it affords me any amount of pleasure to secure the highest award at this exhibition. One gentleman stated last night about hens and roosters scratching gravel, and I can say that if you want to win this trophy you have got to get down and scratch gravel. I wish to thank Mr. Henderson of the Windsor Salt Co., for his kind donation, and I also wish to thank The J. B. Ford Co., of Wyandotte, Michigan, for their beautiful carving set. I feel something like the Irishman who was asked to give his opinion as to the best piece of pork in a hog. He said, "Faith I will take the piece between the nose and the tail." And in winning so many prizes, which I feel positively proud of, I feel something like the Irishman, as though I had the piece between the nose and the tail. The best part of it is, it is an Irishman that has won. (Laughter and applause.)

Mr. RUDDICK: Mr. Donnelly has another honor in connection with this competition, and that is, that he has two sons who also won prizes in the Butter and Cheese Competition.

The CHAIRMAN: It affords me a great deal of pleasure to have the honor of introducing to you this evening the new Minister of Agriculture. I believe this is the first public appearance of the honorable gentleman before an audience in this capacity in the western part of the Province. I bespeak for him your earnest attention, and I trust he will give you something to carry away of interest and profit.

IMPROVING FARM LIFE.

By Hon. J. S. DUFF, Minister of Agriculture for Ontario, Toronto.

I am very pleased, indeed, to have the privilege and honor of putting in a few moments at least with you in connection with your annual convention. I was very pleased to-day when Mr. James told me what a fine meeting you were having in Brantford, and of the splendid audience that was present last night. I am also delighted to know that this afternoon this beautiful hall was filled with people interested in your work. I can quite understand that people who come to these meetings do so at a great deal of self-sacrifice. They leave their homes and their business and their work to come here in order to meet together comparing ideas and looking over the work of the past year, and go home with a fresh determination and renewed enthusiasm to enter the work of another year.

The Dairy Associations of this Province are among the greatest subdivisions of agricultural work in this Province. When we look back over the past and see what the dairymen have accomplished, we see it has been a matter of gradual but progressive growth. I often think that it is a pity that we who till the soil, we who are the farmers of this beautiful country,

do not take greater pride in our work than we do. It has sometimes occurred to me that it is because of the fact that after spending so many hours working, we do not feel after the day's work is done like going around and fixing up this corner and beautifying this nook and giving everything that air of happiness and prosperity which does so much to make homes attractive. But, after all, we are gradually gaining and making rapid progress. I can remember when there were a great many log houses in the neighborhood in which I lived, and in fact, outside of a very few, I can remember when all the beautiful homes we have in that section now were built; and even now as we go about we can see a gradual improvement.

I do not propose to talk to you about the dairy interest, except in common with other interests. I know from looking at the papers this evening that last night you had statistics given you as to the development from year to year in connection with the dairying interests of this Province, and we have that sort of thing given to us in the newspapers from time to time, and you are all as familiar with it as I can possibly be.

As you go through the Province you will notice a great change in farm homes. You will notice that the log houses have disappeared, and the new barns are up and beautiful new homes, and although there is perhaps nothing at present to beautify the surroundings, as time goes on you will notice a few evergreens planted here and there, or some rows of maple trees, or the beautiful elm, of which we are all so proud. Our farmers are carrying out the idea that beautiful surroundings have much to do with success; and not only that, but these trees help to protect our buildings and our homes from the winter winds, and very often from the summer's sun.

It was said to-day that there should be something done towards keeping the boys on the farm. My own impression is, that no action of the Government or any other regulation will bring that about. You know it is the glory of the British race that they will strike out. We are great to-day in Canada, because of the hardy pioneers who came across the briny deep from France, England, Ireland, and Scotland in the centuries gone by, and the same spirit is true of the British people, no matter where you find them; and when you see boys raised on the farm striking out and becoming mechanics, doctors, lawyers or clergymen, they are only carrying out the instincts of their nature, and in the same way they leave their beautiful homes and strike out for the Western country and make homes for themselves on the prairies, and I do not think any legislation we can enact will make any man stay on the farm.

But there is such a thing, perhaps, as making the farm so attractive that young men will feel, after all, there is no place like the farm. I have seen a good deal of this Province. I have been mixing in public life for a number of years, and the last ten years it has been my privilege to see a good deal of what we call city or urban life. But I go home to the farm, and I think as I look over those fields, and I conclude that, after all, it is the most beautiful place in the world for me. I might have been constituted otherwise; I might have had dreams of becoming a merchant prince in the city, or one of our great lawyers, who has brought fame to this country and to their own farm homes; but I have not had these dreams. I have always thought there is no place like the farm, and I am on the farm to-day because of that fact. There is one agency that I think will encourage, if anything will, the young men to remain on the farm, and that is, the beautifying of the homes—giving the boys to understand that life on a farm is not the slavish life that some people say it is, and that as decade and decade of years pass by, conditions will become better, and that we will be in a better position to enjoy life than our fathers.

Life is not hard on some farms to-day. Some persons will say, "Yes, it is hard." Well, it is hard in this way; inasmuch as the man who makes a success on the farm or makes a success of a dairy herd, or by raising swine, or breeding horses, or any other phase of agricultural life, must work hard. He must attend to his business. But the same is true of every other line of life. There is not a successful doctor, lawyer, or clergyman in Canada to-day who has brought a name to the profession in which he is engaged, who has not worked hard. After their clerks have retired from the store, these men have spent hours and hours in their offices, in mastering their business, so that they can reach out and make more in the next great deal in which they are occupied.

The lawyers who occupy the high places in the legal profession have got there by hard work. Men never obtain high positions in any calling in life unless they work hard, but working hard should not be a drudgery. I sometimes think that the best man we have in Canada is the farmer that works hard. If there is any man to be pitied, it is the lazy man, and particularly the lazy farmer. (Applause.)

Beautifying the farms would have the effect, I think, of inducing the boys to stay on the farms. There is another way in which you might induce your boys to stay on the farm, and that is, to give them an idea as years roll on they will not have to work as hard as you did. I am sure almost every man will say, "I have not to work as hard as my father did." What work do we do in Ontario to-day compared with the work of the pioneers. These hardy men and women who made great sacrifices, and not only drove oxen wagons away back into the wilderness, but in many instances walked in, in order to erect the first shanty, and to have a little home until they could get the surroundings cleared in order to get a little of the necessaries of life.

As you look back over this beautiful Ontario, while we are proud of our cities and towns, as we should be, and while we are proud of the magnificent strides we are making in building up within our own borders such a splendid urban population, yet there is no class of people whose hearts should thrill with pride as the farmers, as they think of the hardships they have endured in order that we might have the beautiful homes we have to-day. When you think of the old days when it was chopping and logging, and logging and chopping—when it was a steady fight year in and year out with the gigantic forests with which this country was covered—and when you think to-day that that is all gone, and that the farms have all been cleared and commodious stables and barns erected, and lovely houses on almost every farm, surely it ought to be an incentive to a young man to live on a farm. And if that is not all, life on the farm is an occupation that he ought to be proud of. If, however, the condition and surroundings in which he was born and brought up do not induce him to stay on the farm, I think that boy had better not stay. He had better strike out and go wherever the bent of his mind may lead him, and if he should leave the farm and bring success to the vocation or calling in which he may cast his lot, then that is an honor to the old farm on which he was born and brought up.

Last night I was at a banquet in Toronto, given in connection with the Horse Show, and the Chairman, Mr. J. P. Allan, who is one of the merchant princes of the City of Toronto, and who was born and brought up on the farm, and who knew the hard work of a farmer's life in his early days, in speaking as he did of that old farm last night, made me feel that after all it might be said the city and farm are not so far apart. You know there are people in this world to-day who do not speak nicely of the city people, and some city

people who do not speak nicely of the farmers; but so far as I am concerned, I simply feel like treating the people of both classes like that with contempt. We should not have that sort of thing in this country of ours. It should be the interest of the city people to cultivate and cement and make more firm than ever that friendship and community of interest that links your interest and theirs, because you could not live without them.

Where would this beautiful city of Brantford be were it not for the splendid agricultural country surrounding? The same might be said of every city, town, and hamlet that we have in Ontario; they are all dependent on the farmer. You know the old song, "The farm feeds them all." But, after all, what would the farmer be without the cities and towns? We occupy a unique position as farmers to-day in Ontario in being closely situated, and having almost all the advantages that our brothers and sisters have who live in the cities. Why, a man living within ten miles of a city like Brantford is just as well situated as if he lived in the heart of the city. The same thing is true all over the Province. The very fact of all our relationship being of a nature that one is dependent upon another, and we should endeavor to cultivate that to such an extent that your boy or your girl will see a greater community of interest and see a greater appreciation of the work each of the other.

Agriculture has a great many diversified forms, and I will just speak of a few of these. You are engaged in dairying, and if you go to a locality where dairying is carried on, you will find that the farms are richer and more productive that where it is not. The richest land in this Province is land where that which is grown upon it is fed on the land and sold in beef and cattle, butter or cheese; because when you sell the food in concentrated form such as that, instead of robbing the farm, you are gradually building it up. No doubt many of you will say the land is not nourished as it used to be years ago when it was new land. I think it is true of the neighborhood in which I live, that the land is richer than when the trees were taken off. That is, the land which has been carefully taken care of and nourished and fed. Land cannot help but increase in value where dairymen carry on their operations to any great extent. It was my privilege last spring, and also last fall during the elections, to be up in the western part of the Province. I was through the Perths and the Oxfords, and as I travelled through these counties and saw those beautiful farms I do not think anybody can tell me that these farms are not better now than they were when the land was first cleared. Everybody knows they are, and why? Because through these districts the people are engaged in dairying, and in raising cattle, and in feeding the produce of their farms to their stock. In the section of the country where I live it was always a grain growing country from the first time the trees were cut, and they could have magnificient crops of wheat, and for that very reason they never branched off into dairying and other lines. In other sections the land was not so good when it was first cleared. I could take you up into the county of Grey, and take you through some townships that when they were first cleared had so much frost that the farmers became disheartened, and they were driven into the live stock business. To-day these townships are richer townships than those in the section where they grew wheat; and that came about just from the fact that they were forced, owing to the conditions in which they found themselves, to branch off into other lines.

There never was a time when there was more time for real successful grain-growing in this Province than there is to-day; and there never was a time when there was more room for dairying and live stock, sheep, swine, and horses than there is to-day.

I sometimes think that the men who lead in these special lines of agricultural industry have done more for the people of Canada than any other class of men we have ever had, because they have been men of strong character, and men who have had hope in the future, and who knew all they had to do was to presevere and in the end they would conquer, and they have conquered. The result is that we find Canada to-day occupying a magnificient position, not only in relation to its dairy interests, but also in relation to its live stock and grain as well.

I am glad to say that the Government of the Province has always been imbued with the idea that it was their duty, as far as possible, to help the agriculturists of this Province, and I feel that I am speaking authentically when I tell you that every man who has had the honor to precede me in the position which I now fill, that of Minister of Agriculture for this Province, from the days when Mr. Charles Drury was appointed right down to the present time, felt that it was their duty to foster the agricultural interests of this Province and do all they could to help it along.

But someone will say, " What are you going to do about it?" Well, I do not know that I will promise to do anything. I have felt that we are spending so much money at present in connection with agriculture in this Province that we have got pretty near to the limit to which we can go. When you know that the last year's appropriation was about $775,000—more than three-quarters of a million of money spent in the interest of agriculture in the Province of Ontario—you will understand we are doing a great deal. You know the Province is not like the Dominion. In the Dominion Government they are better off than we are in one way, because they can make their own tariff and rake in whatever they want, and whatever they say we have to pay we must pay.

The provinces are not so fortunately situated. We have certain revenues, but we do not control these revenues. In fact, it just depends upon the growth and development of the revenues themselves more than any act of the Government, as to what we shall get from them. So you see, when you come to the Provincial Government and ask for money you must expect the Provincial Government will say to you, "We would not like to go any further in spending than we are doing."

There are many other ways in which the Governments of to-day are able to help the people of this Province. I had a gentleman call upon me to-day in Toronto from Eastern Ontario who went to the city of Montreal and was very successful in business and made a great deal of money. About twenty-five years ago he came back to the county of Glengary and bought a farm. He made up his mind he would come back to that farm and make it pay. He had been up to see the Premier in his Department, and he telephoned to me that he was coming down to see me. He had been a schoolmate of the Premier's in their early days, and so he came in and told me what he wanted. He said, "Although we don't look through the same political spectacles, I want to talk to you." I told him that it did not make any difference, and he said he thought we ought to have in this Province what he called a "Land-doctor." What he meant by that was that we should have devised in some way or other a plan whereby our farmers would be able to apply the outcome of scientific investigation to their farms. He put it to me in this way, "If I have a sick horse I send for a veterinary, and if the land is sick, don't you think I should have a doctor who understands it?" A man must understand chemistry to understand the land. There is a great

deal in it, and I made this suggestion, and he thought it a fairly good one. I said we could send broadcast through Ontario bulletins from the Chemistry department of the Agricultural College and give the farmers some idea how to treat different kinds of soil in order to bring about the best possible results.

We have one department that is already doing wonders in that direction. Mr. W. H. Day has charge of the drainage work at the College. There is no doubt that if this Province was properly drained it would grow one-third more grain or grass than it does. We have thousands of acres that it would pay the farmers to drain. It brings about the result that the farmer is not only able to get on the land earlier in the spring, but in a dry season that land will stand the drouth better. But of course a man might have a farm well drained that might not have a soil that would give the best results. The object of the gentleman who called on me was to say that the Department should have something that would enable the farmers to understand the different soils and drain them in such a way as to bring about the best results.

I cite this only to show that there is a development amongst the farmers of this Province all along the line. This man told me that when he built beautiful barns and a beautiful house he thought he would go into the dairying, and he got a splendid lot of cows. As he had no boys of his own he had to depend on other help, but it was so unsatisfactory that he cut it out, and now he is buying stock in the fall and feeds from one hundred to one hundred and twenty-five steers every winter. He dehorns them, and feeds them loose in large stalls, and he finds that his farm is becoming richer and richer every year. He told me that they grew on that one hundred and twenty-five acre farm in one year 10,000 tons of stuff. One winter when he was feeding so many of these steers they used a ton of straw every day for bedding, and you can facy a 125-acre farm given that kind of treatment must grow great crops. And he said that in one instance they grew five ton of clover hay to the acre. The farmer likes to have a little money at the end of the year. They do not feel that it is pleasant to work hard during the year and not have something to show for it except their board and clothes. Supposing you had a $5,000 barn and a $5,000 house, that is $10,000 invested in your buildings, what would you put your land value at? And this man said $100 an acre, that is in round figures $20,000 invested. Can you have a dividend a good deal better than bank interest over, after paying expenses? When I asked him this he said, "Yes." And after all that is the best test.

I do not propose to speak any longer. I only came up to wish you God speed in your work.

The CHAIRMAN: I wish to assure the honorable gentleman that the friend who called upon him in Toronto and brought to his notice the point in connection with establishing a land-doctor did a good thing, and the members of the Western Ontario Dairymen's Association have said for some time that the time was opportune for such a move. We want a chemist and a bacteriologist in connection with our work, and it seems to me that it would be a mistake on my part if I did not on this occasion clinch the idea he has thrown out, and tell him we are not going to stop, and we will perhaps approach him for some assistance in this line.

ILLUSTRATED ADDRESS.

Mr. J. A. Ruddick, Dairy Commissioner, Ottawa, then gave a very interesting lecture, illustrated with lantern slides of dairy buildings, dairy herds, and dairy farms in different parts of the world. His lecture took the audience on a trip around the world, and was much appreciated.

IN MEMORIAM.

Hon. Thos. Ballantyne.

That this Association, in annual convention assembled, desire to place on record an expression of their deep sense of the great loss which has been sustained not only by this Association, but by the dairying industry of this country, in the removal by death of the late Hon. Thos. Ballantyne, of Stratford, Ontario, who during his life time did more than any other man in Canada to promote what is to-day the great dairy industry.

Over forty years ago he with a few others introduced in this Province co-operative dairying, believing in the great possibilities of the industry. He never neglected an opportunity to preach the "Gospel of Dairying," whether as President of this Association (a position to which he was elected by his fellow-dairymen no less than nine times) or in his business relations as a cheese buyer and exporter, his watchword was always "Quality" and progressive methods, and his dealings were characterized by a high sense of honor and the advancement of the great dairy industry.

That this resolution be placed in the records of this Association and a copy forwarded to the family of deceased.

Mr. Harold Eagle.

That this Association in Convention assembled, desire to place on record an expression of their deep sense of the loss we as an Association have sustained in the removal by death of Mr. Harold Eagle, of Attercliffe Station, Ontario, who for a number of years faithfully and ably served this Association on the Board of Directors and during the years of 1898 and 1899 as President.

Mr. Eagle was instrumental in doing a great deal for the promotion of the dairying industry in the district which he represented as an officer of this Association.

That this resolution be placed in the records of this Association and a copy be forwarded to the family of the deceased.

RESOLUTIONS.

The following resolutions were adopted:—

"Whereas the success and educational value of this Convention and the interest taken therein is due in a marked degree to the presence of speakers who have kindly addressed our meetings, we desire to express our sincere thanks for their assistance and presence throughout the various sessions."

"That we, the members of this Association, desire to express our appreciation of the kindness of the Mayor, Board of Trade, and citizens of Brantford in furnishing the use of the Opera House, together with the excellent musical part of the programme free of charge for the Convention and Dairy Exhibition; also to the press for the excellent reports given by them of this Convention."

"That the thanks of the Convention be and are hereby tendered to the Canadian Salt Co., of Windsor, Ont., through their General Manager, Mr. E. G. Henderson, for the very handsome badges presented by the company to the Association."

"That the thanks of the members of this Association be and are hereby tendered to the Heller & Merz Co., New York; The R. M. Ballantyne Co., Limited, Stratford; C. H. Slawson & Co., Ingersoll; J. B. Ford Co., Wyandotte, Mich.; The Canadian Salt Co., Windsor; The Western Salt Co., Mooretown; Ryrie Bros., Toronto; for the special prizes kindly donated for our Dairy Exhibition."

"That we feel as Dairymen we are under great obligations to the Ontario Department of Agriculture for the assistance they have rendered the Dairy industry, through the system of instruction that has been given, and also in providing speakers to attend annual meetings of cheese factories and creameries."

"That we wish to express our appreciation of the work of Hon. Nelson Monteith while Minister of Agriculture for Ontario, and extend to him our very best wishes for the future."

"That we, as dairymen, believing that the work of cow testing Associations is conducive to increased production, wish to express to the Hon. Sydney Fisher, Minister of Agriculture for Canada, our appreciation of this work, and would humbly suggest that it be continued."

The Convention then adjourned.

APPENDIX.

THE MANUFACTURE OF WHEY BUTTER.

The making of butter from the fat left in whey, the by-product in the manufacture of cheese, has received more or less attention from dairymen during the past two or three years, and it was thought well by this Department to have experiments conducted therein, under factory conditions, during the season of 1908. We have pleasure in presenting herewith the reports submitted by the persons who conducted these experiments.

In estimating the probable profits in the manufacture of whey butter, the producers should not lose sight of the fact that whey from which the fat has been extracted is much less valuable for feeding purposes than the whey in which the fat is retained.

In the 1908 Report of the Agricultural College, page 147, will be found results of experiments conducted by Pro. G. E. Day, in the feeding of ordinary whey and meal as compared with separated whey and meal. The difference in results indicated that 1,000 pounds whey in which the fat has been retained is worth 43.7 cents more than the same quantity of whey from which the fat has been extracted. When both the cost of manufacture and the feeding value of the fat in the whey are considered, butter would require to bring more than the average price during the past few years in order that the manufacture of whey butter could be carried on at a profit.

It must be remembered that the whey as usually delivered to the farmer does not contain all the fat which was in it when taken fresh from the vats. In unpasteurized whey a good deal of this fat is left in the tanks at the factory. Where the whey is pasteurized, the fat remains equally distributed in the whey and therefore renders it of much greater value for feeding purposes. For particulars as to the methods of pasteurizing whey, we would direct the readers to the report of Mr. Frank Herns, as given in this volume. It must be remembered that Prof. Day conducted only one experiment in which comparison of separated and ordinary whey was made, and Prof. Day is inclined to the opinion that the fat retained in the whey would not always show such a high feeding value. He is convinced however, that in the past too low an estimate has been placed upon the value of the fat contained in the whey for feeding purposes.

We would ask the farmers and manufacturers to consider very carefully the reports presented herewith, as as well as the experiments conducted by Prof. Day, before deciding to install equipment for the manufacture of whey butter.

EXPERIMENTS CONDUCTED AT THE KERWOOD CHEESE AND BUTTER FACTORY.

By Frank Herns, Chief Dairy Instructor for Western Ontario.

The work was begun on May 15th, and continued each day throughout the season. The Kerwood factory makes butter the whole year, and both cheese and butter for from six to eight months. It is well equipped and well managed. Ejectors, and piping and other necessary equipment was put in, so that the whey could be ejected from the cheese vat into the milk receiving vat and then pumped into the tempering pan from which it ran to the separators. In the morning the two or three separators were started, and the milk that was to be used for butter making was skimmed, while that which was to be made into cheese was conducted to the cheese vat and the process proceeded with. By the time the milk was skimmed and the separator stopped and washed, some of the whey was ready to draw off the cheese vats. The separators were then started again and the whey skimmed, allowing it to pass into the whey tank. By ejecting the whey from the cheese vats to the receiving vat it raised the temperature to about 128 degrees for skimming. The DeLaval Separator Company very kindly loaned a special top cover for one machine which had a large feed tube, allowing from 4,000 to 4,500 lbs. of whey to flow through the bowl per hour. A small hand churn was used for churning and a lever worker for working the butter.

Records were kept and tests made each day. Different methods were tried. Sample boxes of butter were placed in cold storage and scored by experts from time to time to find out its keeping and general qualities. Samples of finest creamery butter made the same date were placed in storage beside the whey butter for comparison and also to find out if possible if the whey butter went off in flavor in less time than creamery butter. Samples of whey and creamery butter were also stored in an ordinary storage at comparatively high temperature to find out the effect of such storing and to compare the two butters as to general conditions when treated in this way. Records were kept to find out the average loss of fat in the whey when ready to run off the curd, and to find how much whey butter could be made on an average from 1,000 lbs. of whey; also to find out if possible the best system to practice for ripening and churning whey cream, if a high or low per cent. of fat in the cream, if a high or low temperature for churning and washing was preferable; also if the cream should be ripened naturally or with culture or whether it should be ripened at all, or if better butter could be made by churning the cream sweet and at low temperature with culture added just before churning. Pasteurizing the cream was also tried with good results.

We wished to find out the loss of fat in the butter milk under different conditions, the per cent. of over-run and the per cent. of moisture in the butter, the effect of cheese color on the butter, the cost of making a pound of butter and the general quality, and how such butter would sell among the patrons and on the open market.

It was impossible to skim all the whey at all times, since no storage tank could be provided, and if the curd was taking on acid very fast the whey might have to be drawn faster than it could be skimmed, so that occasionally some of the whey was allowed to run into the tank without being skimmed.

The total number of pounds of milk used during the time the experiments were carried on and made into cheese was 945,492 lbs., or about 7,800 lbs. per day. The average per cent. of fat in milk for the month of June was 3.24 per cent.; for July, 3.33 per cent.; for August, 3.5 per cent.; for September, 3.64 per cent. The average for the four months was 3.43 per cent.

(The Dairy Instructors made 395 tests during the season of six months covering all the cheese factories in Western Ontario for the per cent. of fat in the milk in the vats, and the average of their test was 3.5 per cent.) The estimated pounds of whey skimmed was 826,406 lbs. This is probably not accurate, since there was no way of weighing each day the amount of whey skimmed. The average number of pounds of whey skimmed in June per day was 5,720 lbs., in July 8,497 lbs., in August, 8,947 lbs., in September, 8,062 lbs., or an average per day for the four months of 7,800 about.

Loss of Fat in Whey: The average mechanical loss in the whey when ready to run off the curd was found to be for the four months, .241 per cent. It was as high as .33 per cent. and as low as .15 per cent. The average loss in June, .254 per cent.; for July, .245 per cent.; for August, .225 per cent.; for September, .24 per cent. The loss was usually greater when the milk was over-ripe or gassy, but not at all times. There was at times a high loss for no apparent cause, while at other times the loss was comparatively small when the milk was really in a condition that the loss should have been greater.

(Note.—From a total of 381 tests made by the Dairy Instructors in each group in Western Ontario this year representing from three to five tests at each factory the average mechanical loss of fat in the whey when ready to run off is .23 per cent., as high as .35, and as low as .15).

Skimming the Whey: The whey was ejected from the vats to the separators, skimmed at an average temperature of 128° F. An average amount of 4,100 lbs. per hour was put through each machine. By having the enlarged feed tube, 4,200 per hour could be skimmed with only a trace of loss in the skimmed whey. As high as 4,800 lbs., per hour and as low as 3,000 lbs. per hour was tried. The average loss of fat in the whey for the four months after being skimmed was .026 per cent., as high as .03, and as low as .01. With the enlarged feed tube 20th Century machine, 4,100 to 4,200 lbs. of whey per hour could be skimmed with only a slight trace of loss of fat in the skimmed whey, at a temperature of 128° F.

The Whey Cream: Cream from 27 per cent. to 63 per cent. was skimmed, a total of 3,312.9 lbs., testing on an average of 44.2 per cent. (Note.—It might be difficult to skim a 60 per cent. cream with some separators, particularly if the whey was at all cold, say less than 120 degrees). We did not try skimming with any other separator except the DeLaval.

Pasteurizing the Cream: This in a number of cases improved the butter both in flavor and keeping quality. In a few cases it did not, but the general conclusion was that pasteurizing the cream and cooling at once was an advantage so far as the quality of the butter was concerned.

Ripening and Churning the Cream: These conclusions were reached from the work done so far: 1st. The richer the cream up to 60 per cent. the better flavored the butter and the better the body and texture. 2nd. Thin cream takes on acid rapidly and tends to affect unfavorably the flavor of the whey butter. 3rd. Leaving the cream at a high temperature for any length of time after skimming affected unfavorably the flavor of the whey butter. 4th. Allowing the cream to ripen or develop much acid either naturally or by the addition of culture long enough before churning that much

acid would develop, affected unfavorably the flavor of the whey butter. 5th. Allowing the whey to stand very long before skimming or to develop much acid affected unfavorably both the flavor and the color of the whey butter.

The work done this year points to skimming a rich cream, pasteurize the cream if possible, cool at once to a low temperature 40° to 48° F., depending on conditions for churning. Hold at a low temperature over night or until such time as the fat is thoroughly firmed (5 hours at least), then add 20 to 25 per cent. of good culture with an acidity of 5 per cent. to 7 per cent., and churn at once at as low a temperature as will bring the butter in the usual churning time. The whey cream if rich enough will churn in the same length of time at lower temperatures as ordinary cream and will also churn quite easily with very little acid, or comparatively sweet. Better results were obtained by keeping the cream at low temperatures and as sweet as possible up to churning time and then adding the culture. Whenever the cream was allowed to develop much acid either by the addition of culture or naturally the flavor of the butter was not so good. Holding quantities of whey before skimming or quantities of cream before churning for one or two days, and of course longer, was detrimental to the flavor of the butter. The more acid developed on the whey before skimming and on the cream before churning the poorer the flavor of the butter, and also the higher the color. Skimming the whey at once when ready to run off the vat, cooling the cream at once to a low temperature and keeping comparatively sweet until ready to churn, adding the culture just before churning, and churning at a low temperature gave the best results as to flavor, body, texture and color. The shorter the time the culture was in the cream before churning the better the results. By allowing the culture to develop in the butter rather than in the cream better results were obtained. Ripening or churning the cream at high temperature, 50° F. or above, gave poor results.

Loss of Fat in the Butter Milk: Average loss of fat in the butter milk for the four months was .83 per cent.; for June, 1.5 per cent.; for July, .7 per cent.; for August, .43 per cent.; for September, .91 per cent. The loss ran as high as 3.2 per cent. and as low as .1 per cent. Where the cream was churned at high temperatures the loss was greatest, or where ripened at high temperature, even though churned at fairly low temperature. When ripened and churned at low temperature the loss was comparatively small, provided the cream was rich in fat.

Moisture in Butter: The average moisture for the four months was 12.8 per cent.; as high as 17.05 per cent. on two occasions only, churned at 60° F., and as low as 11 per cent. fat, usually when the cream was churned at fairly high temperatures, 55° to 60° F.; the moisture content was high, although it was often high (15 per cent.) and low (11 per cent.) for no apparent reason.

Amount of Butter Made: In June, 298.5 lbs. of whey butter was made and sold for 18 cents per lb., amounting to $53.73. Finest creamery butter made in June sold for 22 cents per pound. In July, 407.5 lbs. of whey butter was made and sold for 20 cents per lb. up to July 20th, and 22 cents per lb. for balance and month, or 315.5 lbs. at 20 cents, amounting to $63; 10 and 92 lbs. at 22 cents, amounting to $20.24, making a total of $83.34. Finest creamery butter sold in July for 23.74 cents per lb. In August, 456 lbs. of whey butter was made which sold for 22 cents per lb., amounting to $100.32. Finest creamery butter sold in August for 25 cents per lb. In September, 457 lbs. of whey butter was made which sold for 22 cents per lb., amounting to $100.54. Finest creamery butter sold in September for 25 cents per lb.

The total butter made for the four months was 1,619 lbs. which sold for $337.93.

Over-Run: The total number of pounds of butter fat recovered for the four months was 1,420.7, the total pounds of butter made was 1,619 lbs.; the over-run therefore was 14 per cent.

June—fat, 266.5 lbs.; butter, 298.5 lbs.; over-run, 12 per cent.

July—fat, 370.7 lbs.; butter, 407.5 lbs.; over-run, 9 per cent.

Aug.—fat, 403.4 lbs.; butter, 456.1 lbs.; over-run, 13 per cent.

Sept.—fat, 380.1 lbs.; butter, 457.1 lbs.; over-run, 20 per cent

Cost of Making one Pound of Whey Butter: Under Kerwood conditions, which are probably better than some factories from the fact that all the machinery is placed and in operation every day and cheese and butter made each day, the cost of making one pound of whey butter is estimated to be 7 cents, *but there is no profit for the manufacture at this price.*

Amount of Butter from 1,000 lbs. of Whey: From two to two and one-half pounds of butter can be made from 1,000 lbs. of whey.

Effect of Cheese Color on the Butter: Cheese color affects the butter in color very little provided the whey is skimmed sweet and churned as sweet and at as low a temperature as possible. The collecting of whey or cream for two or more days has a tendency to heighten the color of whey butter. Hansen's Cheese Color to the amount of one ounce per 1,000 lbs. of milk was used. When white cheese were made in September 1-16th oz. of butter color was used in the whey cream in order to get a proper butter color.

Quality of the Butter: In no case was the whey butter found to be equally as perfect in flavor as the whole milk creamery butter. The whey butter has a peculiar flavor of its own, but which is not at all times in any way disagreeable. It would not all class as first grade creamery butter, but would certainly if properly made grade as first grade dairy butter, and is equal and perhaps sometimes superior to some of the rather inferior creamery butter. The character of the butter will depend almost entirely on the conditions under which it is made. It is certainly marketable butter, and as mentioned before, will compare very favorable with some of our poorer creamery butter, and is far superior to the average class of dairy butter.

Keeping Qualities: The whey butter keeps very well in cold storage at 10° F.; in fact the flavor and general condition of the butter after one month, two months, three months, and four months in cold storage is practically as good as when first put in storage, allowing of course for the general depreciation of all butter at that age. Appended is a record of the scores made by experts of finest creamery butter and whey butter placed in storage at the same time, held the same length of time at the same temperatures, which will give an idea of the keeping qualities of both butters. Unless frozen it should be consumed at once, or as soon as possible after making. Some experts, commenting on the quality of the butter in storage, say it is not export butter.

The Opinions of Kerwood Patrons of the Value of this Butter: 1st. They say it does not stand up in the heat as well as the creamery butter. (Note.—Holding the cream at a low temperature for a sufficient length of time and churning at a low temperature and skimming the whey at a temperature of 98 instead of 128 degrees might help this condition.) 2nd. At 3 cents per pound less in price than Kerwood creamery butter a great many of the patrons prefer whey butter. No patron would prefer to take whey butter for their own use instead of creamery butter at the same price.

Large numbers of Kerwood patrons used this whey butter all season and are still using it, and were well satisfied with the quality. There has been no dissatisfaction of the patrons in the matter of skimming the fat from the whey.

Selling on open Market: Some of the whey butter was sold to one of the best grocers in the city of London, under a special brand (Crown Brand), and no difficulty was found in disposing of this butter at prices from 1 to 3 cents less than the retail price of finest creamery butter made at the same factory in which the whey butter was made. In fact the grocer affirmed that he could find a line of customers who would readily take this butter at the lower price.

Storage must be Provided: It would be absolutely necessary for cheese factories undertaking to make whey butter to provide ice for cooling the cream and also a proper storage which could be kept at a low temperature, as it would be a great mistake to send this butter out to patrons or customers without first thoroughly cooling after being churned.

It would be the height of folly to attempt to make this butter without making ample provision for a proper plant, storage tank for the whey which can be kept absolutely clean, plenty of ice cold water, and a small storage. Small sized churns and workers are best, since the cream should be churned every day, even if several factories combined, skimmed the whey and sent the cream to a central plant to be churned. Even under these conditions ice should be provided at each factory to cool the cream to a low temperature immediately after it was skimmed.

With reference to the loss of fat in the whey and the amount of butter which can be made from 1,000 lbs. of whey, the loss draining from the curds after dipping, milling, and in the press is not taken into consideration, as it is just possible that it would be difficult under practical conditions to manufacture this fat into marketable butter. The only fat therefore taken into consideration in these experiments is that which was lost in the whey up to and at the time of dipping, or drawing the whey off the curd.

Assuming that the average lost of fat in the whey in Western Ontario is .23 per cent. we would have 2.31 lbs. of fat recovered from 1,000 lbs. whey. Adding one-sixth to this would be practically .4 for over-run. We would therefore have 2.3 lbs plus .4 lbs, which would make 2.7 lbs. of butter as an average amount that can be made from 1,000 lbs, of whey, taking the whole season into consideration. There is however a small loss in skimming of about .02 per cent. or perhaps a little more, if too large a quantity of whey is run through the separator. This would equal .2 lbs. loss in 1,000 lbs. of whey. Subtracting, therefore, .2 lbs. from 2.7 lbs. would leave 2.5 lbs. of butter from 1,000 lbs. of whey. There is also a small loss of fat in the butter-milk, which would slightly reduce the amount to perhaps 2.3 lbs.

No. 1. Butter scored by I. W. Steinhoff. Was made and placed in the London Cold Storage on the dates mentioned.

Scored by I. W. Steinhoff.	Flavor, 45	Body, 25	Color, 15	Salt, 10	Style, 5	Total, 100
Creamery Butter, made June 9th, No. 1,						
Scored July 9th	41.5	24.5	14.5	10	5	95.5
" Oct. 17th. Same butter	41.5	24	14.5	10	5	95
Whey Butter, made June 9th, No. 2,						
Scored July 9th	41	24	14.5	10	5	94.5
" Oct. 17th. Same butter	40.5	23.5	14	10	5	93
Creamery Butter, made June 16th, No. 1,						
Scored July 9th	43	24.5	14.5	10.5	5	97
" Oct. 17th. Same butter	41.5	24	14	10	5	94.5
Whey Butter, made June 16th, No. 2,						
Scored, July 9th	42	24.5	14	10	5	95.5
" Oct. 17th. Same butter	40	23 5	14	10	5	93
Creamery Butter, made June 23rd, No. 1,						
Scored July 9th	42	34.5	14.5	10	5	96
" Oct. 17th. Same butter	41.5	24.5	14.5	10	5	95.5
Whey Butter, made June 23rd, No. 2,						
Scored July 9th	40	23.5	13.5	10	5	92
" Oct. 17th. Same butter	41	23.5	13	10	5	92.5
Creamery Butter, made June 30th, No. 1,						
Scored July 9th	40.5	24	14	10	5	94.5
" Oct. 17th. Same butter	42.5	24	14.5	10	5	96
Whey Butter, made June 30th, No. 2 (*a*), 5% of sugar added,						
Scored July 9th	42.5	24	15	10	5	94.5
" Oct. 17th. Same butter	41.5	24	14	10	5	94.5
Whey Butter, made June 30th, No. 2, (*b*) same as No. 2 (*a*), but no sugar added,						
Scored July 9th	40	24	15	10	5	94
" Oct. 17th. Same butter	42	34	14	10	5	95
Creamery Butter, made July 8th, No. 1.						
Creamery Prints, scored July 9th	42	24.5	14.5	10	5	95
" " " Oct. 17th. Same butter.	41	24	14.5	10	5	94.5
Whey Butter, made July 8th, No. 2,						
Whey Prints, scored July 9th	39.5	24	14.5	10	5	92.5
" " " Oct. 17th. Same butter	40	23	14	10	5	92
Whey Prints Pasteurized, made July 9th,						
Scored Oct. 17th	40.5	23 5	14 5	10	5	93.5
Whey Butter Pasteurized, made July 12th, 1 quarter of 1% of borax added and 5% sugar						
Scored Oct. 17th	41.5	24	14	10	5	94.5
Whey Butter Pasteurized, made July 12th. No preservative added,						
Scored Oct. 17th	40.5	24	14	10	5	93.5
Whey Butter Pasteurized, made July 14th,						
Scored Oct. 17th	38	24	14	10	5	91.5
Same butter, made July 14th, not pasteurized.						
Scored Oct. 17th	40	24	14	10	5	93
Whey butter, not pasteurized, made July 31st.						
Scored Oct. 17th	39	24.5	14	10	5	92.5
Same butter, pasteurized and ¼ of 1% Boracic acid added.						
Scored Oct. 17th	40	24.5	15.5	10	5	94

No. 2. Scored by J. B. Muir. Was made and placed in the London Cold Storage on the dates mentioned. With the exceptions of the last four packages, this is the same butter scored by Mr. Steinhoff.

Scored by J. B. Muir.	Flavor, 45	Body, 25	Color, 15	Salt, 10	Style, 5	Total, 100
Creamery Butter, made June 9, No. 1,						
Scored August 15th	43	24.5	14.5	10	5	97.5
" October 31st. Same butter.	41.5	24	14.5	9	5	94
Whey Butter, made June 9th, No. 2,						
Scored August 15th	41.5	24	14	10	5	93.5
" October 31st. Same butter	39	23	14.5	9	5	90.5
Butter, made June 16th, Creamery No. 1,						
Scored August 15th	43	24.5	15	9	5	96.5
" October 31st. Same butter	42	24	14	9.5	5	94.5
Whey Butter, made June 16th, No. 2,						
Scored August 15th	41	24	14.5	10	5	94.5
" October 31st. Same butter	40.5	24	14	9.5	5	93
Creamery Butter, made June 23rd, No. 1,						
Scored August 15th	43.5	24.5	15	9.5	5	97.5
" October 31st. Same butter	42	24	15	9.5	5	95.5
Whey Butter, made June 23rd, No. 2,						
Scored August 15th	40.5	24	14	9	5	92.5
" October 31st. Same butter	41	24	14	9	5	93
Creamery Butter, made June 30th, No. 1,						
Scored August 15th	43.5	25	15	9	5	98
" October 31st. Same butter	41.5	24	14.5	9.5	5	94.5
Whey Butter, made June 30th, No. 2 (*a*),						
Scored August 15th, 5% sugar added	37	24	14	9.5	5	89.5
" October 31st. Same butter	37.5	23	14.5	9	5	90
Whey Butter, made June 30th, No. 2 (*b*), same as No. 2 (*a*), but no sugar added,						
Scored August 15th	40	24	14	9	5	92
" October 31st. Same butter	39.5	23 5	14	9	5	91
Creamery Prints, made July 8th, No. 1,						
Scored August 15th	41	24	15	10	5	95
" October 31st. Same butter	41.5	24.5	14.5	9	5	94.5
Whey Butter, Prints, made July 8th, No. 2,						
Scored August 15th	39.5	23.5	14	9.5	5	91.5
" October 31st. Same butter	40	23.5	13.5	9.5	5	91.5
Whey Prints, pasteurized, made July 9th,						
Scored October 31st	40	24	14	9.5	5	92.5
Whey Butter, pasteurized, made July 12th, 1 quarter of 1% borax added and 5% sugar,						
Scored August 15th	40.5	23	13	9	5	90.5
" October 31st	40.0	24	14	9	5	92
Whey Butter, pasteurized, made July 12th, no preservative added,						
Scored August 15th	39	24	14	9.5	5	91.5
" October 31st	41.5	24.5	14.5	10	5	95.5
Whey Butter, pasteurized, made July 14th,						
Scored August 15th	38	24	13.5	10	5	90.5
" October 31st. Same butter	40	24	14.5	9.5	5	93

No. 2. Scored by J. B. Muir. Was made and placed in the London Cold Storage on the dates mentioned.

Scored by J. B. Muir.	Flavor, 45	Body, 25	Color, 15	Salt, 10	Style, 5	Total, 100
Whey Butter, same as above, but not pasteurized,						
Scored August 15th	37.5	24	13.5	9	5	89
" October 31st. Same butter	39	23.5	13.5	9	5	90
Whey butter, not pasteurized, made July 31st.						
Scored August 15th	36	23.5	14	10	5	88.5
" October 31st	37.5	24	13.5	10	5	90
Whey Butter, same as above, but pasteurized, ¼ of 1% boracic acid added,						
Scored August 15th	40	23.5	14	9	5	91.5
" October 31st	40.5	24	14.5	9.5	5	93.5
Creamery Prints, made July 31st, placed in Kerwood storage at a temperature of from 40° to 55° up, until September 25th, when they were removed to London storage and placed at a temperature of 10 degrees,						
Scored October 31st	35	23.5	14	9.5	5	87
Whey Prints, made July 31st, placed in Kerwood storage at a temperature of from 40° to 55° up, until September 25th, when they were removed to London storage and placed at a temperature of 10 degrees.						
Scored October 31st	39.5	24	14.5	9.5	5	92.5
Whey Butter, made October 3rd,						
Scored October 31st	39	24	14.5	9.5	5	92
Whey Butter, made October 6th,						
Scored October 31st	39.5	24	14.5	9.5	5	92.5

No. 3. Butter made and stored in the Kerwood Storage at temperature ranging from 48° to 55°. Scored by W. Waddell and F. Herns.

Creamery Prints, made July 22nd,						
Scored on August 22nd, by W. Waddell	38	23.5	14.5	10	5	91
" " September 23rd, by F. Herns	37	23	14.5	10	5	89.5
Whey Prints, made July 22nd,						
Scored on August 22nd, by W. Waddell	36	23	15	10	5	89
" " September 23rd, by F. Herns	37	23	14	10	5	89
Whey Butter, made July 30th, 5% sugar added,						
Scored August 22nd, by W. Waddell	28	23	15	10	5	91
" September 23rd, by F. Herns	37	23	14.5	10	5	89.5
Whey Butter, made July 30th,						
Scored August 22nd, by W. Waddell	40	23.5	15	10	5	93.5
" September 23rd, by F. Herns	39	23	14.5	10	5	91.5
Whey Butter, made July 31st, ¼ of 1% borax added,						
Scored August 22nd, W. Waddell	39	22.5	15	10	5	91.5
" September 23rd, F. Herns	38	23	14.5	10	5	90.5
Whey Butter, made July 31st, no preservative,						
Scored August 22nd, by W. Waddell	40	23	14.5	10	5	92.5
" September 23rd, by F. Herns	37	23	14.5	10	5	89.5

No. 3.—Butter made and stored in the Kerwood Storage.—*Continued.*

	Flavor, 45	Body, 25	Color, 15	Salt, 10	Style, 5	Total. 100
Whey Butter, made August 1st, ¼ of 1% boracic acid added,						
Scored August 22nd, W. Waddell	41	23.5	15	10	5	94.5
" September 23rd, F. Herns	38	23	14	10	5	90
Whey Butter, made August 1st,						
Scored August 22nd, W. Waddell	41.5	23	15	10	5	94.5
" September 23rd, F. Herns	38.5	23	15.5	10	5	91
Whey Butter, made August 3rd, ½ of 1% saltpetre and 5% sugar,						
Scored August 22nd, W. Waddell	38	22.5	14.5	10	5	90
" September 23rd, F. Herns	37	23	14	10	5	89
Whey Butter, made August 3rd,						
Scored August 22nd, W. Waddell	40	23	15	10	5	93
" September 23rd, F. Herns	38	23	14	10	5	90
Whey Butter, made August 20th, pasteurized,						
Scored September 23rd, F. Herns	38	23	14	9	5	89
Same Butter, August 30th, not pasteurized,						
Scored September 23rd, F. Herns	38	23	14	9	5	89

EXPERIMENTS IN THE MAKING OF BUTTER FROM WHEY.

By J. W. Mitchell, Supt. Eastern Dairy School, Kingston.

In accordance with instructions from the Department we undertook, in June last, experimental work in the manufacture of butter from whey under regular cheese-factory conditions. For this purpose two factories, somewhat widely separated from each other, were selected, namely, Balderson in the Perth District, and Harrowsmith in the Kingston District.

We felt, from the beginning, that the two chief points to be considered, and as fully solved as possible, were:

1. Yield, cost of manufacturing and the resultant profit.

2. Quality of product.

As these, in themselves, and other problems associated with them demanded a large amount of detailed information we felt it necessary to prepare a suitable report form. The accompanying is a copy of the form used in the work throughout the season, a report being made out for each day's work. This form proved very satisfactory, and enabled us to keep a complete record of the work done from day to day. It is from the daily reports sent in on this form that most of the data and statements in this report are taken. Such other work was done, and a record kept of it, as was found necessary to supplement the information obtained from the regular reports.

We purpose summarizing in tabulated form the data furnished in the daily reports, and making notes and explanations and drawing such conclusions as seem warranted. In this way the reader will be enabled to examine the data for himself and draw his own conclusions, instead of being forced to accept mere statements.

I.—Yield, Cost of Manufacturing and Resultant Profit.

These will of course be largely influenced by such conditions as the percentage of fat in the whey from the vats, the proportion of fat recovered from the whey in the process of separating, the quality of milk received, the cost of fuel, etc. In this connection the following tables and data should prove of interest and value:—

Table 1.

Month.	Wt. of Milk, lbs.	Wt. of Whey (80% of Milk).	Per cent. of Fat in Whey.		Lbs. of Fat in Cream.	Lbs. of Butter.
			From Vats.	From Sep.		
Balderson.						
June.....	282,118	225,694	.193	.038	351.0	447
July.....	348,712	278,969	.225	.027	553.2	710
Aug	321,269	257,015	.265	.02	627.6	861
Sept.....	210,355	168,284	.302	.02	474.0	633
Oct.	179,646	143,716	.35	.015	486.1	615
Harrow-smith.						
June.....	278,278	222,622	.155	.034	269.7	282
July.....	353,236	282,588	.158	.025	374.8	397
Aug	454,087	363,269	.182	.026	568.1	605
Sept.....	425,225	340,180	.167	.023	489.9	547

Table 2.

Month.	Wt. of Milk, lbs.	Wt. of Whey lbs.	Wt. Cream lbs.	% of Fat in cream	Lbs. Fat in cream	Lbs. Butter.	Yield of Butter per ton of milk	Yield of Butter per ton of whey
Balderson.								
June	282,118	225,694	835	42.0	351	447	3.1	3.9
July.....	348,712	278,969	1,164	47.5	553	710	4.0	5.1
Aug.	321,269	257,015	1,220	51.4	627	861	5.3	6.7
Sept.....	210,355	168,284	961	49.3	474	633	6.0	7.5
Oct.....	179,646	143,716	1,061	45.8	486	615	6.8	8.5
	1,342,100	.....	.....	.....	.....	3,266	.....	.....
Average ..	.....	.....	.....	.....	.....	.....	4.8	6.0
Harrow-smith...								
June	278,278	222,622	1,297	20.8	269	282	2.0	2.5
July.....	353,236	282,588	1,370	27.3	374	397	2 2	2.8
Aug	454,087	363,269	1,400	40.5	568	605	2.7	3 3
Sept.....	425,225	340,180	1,187	41.2	490	547	2.6	3.2
Total.....	1,510,826	.....	.....	.....	.....	1,831	.....	.....
Average ..	.....	.....	.....	.....	.....	.....	2.4	3.0

Cost of Fuel.

Experiments were made at Balderson to determine the fuel cost of elevating the whey from the vats and running the separators. A pump was used most of the time for elevating the whey and steam turbine separators for separating. A good quality of wood, composed principally of elm and poplar, in about equal quantities, was used as fuel. This wood cost $2.75 per cord of 128 cubic feet. The following table gives the results of these tests:—

Table 3.

Fuel cost of elevating and separating whey.

Wt. of Milk.	Wt. of Whey	Wood consumed (c. ft.)	Cost per ton of Milk.	Cost per ton of Whey.	Cost per lb. Butter—6 lbs. to ton of Whey.
lbs.	lbs.		cts.	cts.	cts.
11,033	8,826	12	4.7	5.9	.98
11,405	9,124	12	4.5	5.6	.93
11,029	8,823	12	4.7	5.9	.98
11,103	8,882	12	4.7	5.9	.98
20,140	16,112	24	5.1	6.4	1.06
Average	.....	.....	4.8	6.	1.

Notes.—(1) Price of wood taken at $2.75 per cord of 128 c. ft.
(2) The fire and steam pressure and the amount of water in the *boiler* were left practically the same at the close of the run as at the beginning.

On different occasions we ran our separators in the Dairy School with a view to determining the fuel cost of elevating and separating the whey, using coal as our fuel. Each test extended over a period of three hours. We used a pump for elevating and steam turbine separators for separating. The amount of water in the boiler, the steam pressure and the fire were left practically the same at the close as they were at the beginning of the test. Soft coal slack, at $4 per ton, was used as fuel. The fuel cost of elevating and separating was about 4½ cents per ton of whey. If we take 6 lbs. as an average yield of butter per ton of whey the cost, per pound of butter, for fuel for elevating and separating the whey would be about ¾c. per lb. of butter—say 1c. per lb. of butter if we allow a greater cost for the coal at factory points than at the school.

We are now in a position to make the following estimate, for the months of June to October, inclusive, for the Balderson factory, whose yield per ton of whey is probably a fairly representative one:—

Revenue:—

3,266 lbs. butter at 20c.		$653 20
Expenditure:—		
Cost of fuel for elevating and separating 537 tons of whey at 6c.	$32 22	
Wages of extra man at $50 per month for five months	250 00	
Interest on investment and allowance for deterioration	100 00	
		$382 22
Profit or net revenue		$270 98

Note: (1) It is important that sufficient and suitable help be engaged for this extra work, hence the allowance of $50 per month.
(2) In making the foregoing estimate, instead of making use of the prices received for butter during the past season we thought it safer to base our calculations upon what might be regarded as a more normal price, viz.: 20c. per pound.

There would be, in addition, the butter made during the months of May and November, which would swell the revenue somewhat. Hence we are safe in concluding that the making of butter from whey is a real source of

profit *in a large factory with the average loss of fat in the whey.* Of course, in the case of a factory with an unusually small loss of fat in the whey the net revenue would be reduced accordingly, possibly, in some cases, to the vanishing point.

II.—Quality of Product.

Before making any thorough test of the butter for quality, including its keeping quality, we studied how best to conduct our work in the manufacturing of butter from whey.

The following notes will indicate the conditions under which the butter was made:

1. The whey was drawn from the vats into a lower vat and immediately elevated to an upper one, by means of a pump in the one factory and an ejector in the other, both of which were kept in a good sanitary condition, as were also the receptacles for the whey.

2. Separating was begun immediately.

3. A fairly rich cream was taken, as indicated in Table 2.

4. The cream was put into a can and set in water containing a plentiful supply of ice, and when cooled to 70 or 80 degrees F. a clean-flavored culture was added and the cream allowed to continue cooling to churning temperature.

5. The acidity of the cream when churned averaged slightly below .5 per cent. (5/10).

6. The churning temperature hovered around 45 degrees F., sometimes above, but more frequently below this temperature.

7. The time taken to churn was commonly 50 minutes, sometimes less, but frequently more.

8. We aimed to have the butter granules about the size of wheat grains when through churning.

9. The butter was usually washed but once with water at well temperature, (about 45° F.).

10. The common practice in working the butter was to work it twice, with a lapse of an hour to an hour and a half between workings.

11. A combined churn was used in the work.

In July we began sending butter once a week from the Balderson factory to the Ottawa Cold Storage. Each lot of butter consisted of two 14 lb. boxes, one made from whey, and the other from milk of the same day, the milk being a representative mixture taken from the several vats. The cream from the whey and that from the milk were ripened as nearly under the same conditions as possible, the same culture being used with both.

On September 24th the several lots of butter were scored by Mr. J. A. Ruddick, Dominion Dairy and Cold Storage Commissioner, and Mr. Geo. H. Barr, a member of his staff, no intimation being given them as to which was whey butter and which butter was made from milk. The following table gives the results of their scoring, *for flavor*, 45 marks being the maximum:

Date of Manufacture.	Butter from Milk	Butter from Whey
July 22nd	40	38
" 29th	41	38
Aug. 7th	42	39
" 15th	41	39
" 21st	41	38½
" 29th	42	42
Sept. 5th	41	39
" 17th	42	42½

In the latter part of September we began sending butter again from Balderson to the Ottawa Cold Storage. This second lot of butter was salted at the rate of 5/8 to 3/4 oz. per pound of butter, whereas the butter whose score appears in the foregoing table was salted more heavily to suit the local trade. This second lot was scored for flavor on November 16th by Messrs. Geo. H. Barr and J. Bouchard.

Date of Manufacture.	Butter from Milk.	Butter from Whey.
Sept. 30th	41	38
Oct. 1st	39	37
" 2nd	41	36
" 3rd	38	40½
" 5th	42½	40
" 6th	42	39
" 7th	38	40
" 8th	41	38
" 9th	41½	39

It is perfectly evident from the two foregoing tables that the whey butter did not possess the keeping qualities of the butter made from milk. The butter was all very satisfactory as to flavor when first made.

We would add that during the season we also shipped butter from the Harrowsmith factory to the storage owned by Mr. J. Y. Parkhill, wholesale produce merchant, Kingston, and his comment after scoring it was that whey butter, while satisfactory as to flavor when first received, does not possess good keeping qualities. This butter was examined by Mr. G. G. Publow and the writer, and they quite agreed with these conclusions.

As the whey butter did not prove either to be possessed of as good keeping qualities as the butter made from milk, or, in the opinion of the judges, have as good a texture, we examined several samples of butter in the chemical laboratory. In this connection valuable services were rendered by our lecturer in Chemistry, Mr. W. O. Walker. The following table furnishes a number of representative results obtained:—

No. of Sample	Butter made from	Percentage of moisture in butter.	Melting point of Fat from Butter.	Iodine absorption number of fat.
1	Milk	12.0	86.9°F.	37.8
2	Whey	12.6	86.9°F.	37.9
3	Milk	13.0	85.1°F.	37.7
4	Whey	13.2	85.4°F.	37.6
5	Milk	12.0		
6	Whey	13.2		
7	Milk	13.3		
8	Whey	13.0		
9	Milk	12 0	86.4°F.	36.6
10	Whey	12.3	86.5	36.4
11	Milk	12.0	87.6	36.5
12	Whey	12.5	83.3	35.7

Notes. (1) Each pair in brackets represents butter made from milk and whey of the same day.

(2) It is to be noted that we determined the melting point of the *fat* and not of the *butter*. The method employed was that adopted by the Association of Official Agricultural Chemists, Washington. The melting point of butter-fat, according to authorities on the subject, varies from 82.5 to 91.5 degrees F.

(3) By the iodine absorption number, is meant the number of parts by weight of iodine absorbed by 100 parts by weight of fat. This number, with butter-fat, ranges from 35 to 46.

We thought it possible that the differences which manifested themselves between butter made from whey and that from milk, might be due to a difference between the relative proportions of the various fats composing the butter-fat of each, and that the melting points and iodine absorption numbers would, as a consequence, differ materially from each other. However, by a reference to the foregoing table we see that no decided difference exists between the composition of the butter-fat from milk and that from whey. Also the percentage of moisture in the two butters is much the same.

We would judge, from the results shown in the foregoing table, that the difference manifested between the two butters is not due to any difference in either the butter-fat or the moisture content. It seems to us that this difference must be accounted for in some other way, possibly by the difference in casein content, or possibly by ferments that develop more fully in the whey than in the milk. This would suggest problems for further investigation.

III. Miscellaneous Data.

A. *Distribution of Fat in Whey Tank.*

We asked for reports from a number of factories, not making whey butter, as to the percentage of fat; first, in the whey vats; second, in that drawn from the tank when about one-fourth empty, and third, that from the tank when about half to three-fourths of the whey had been drawn out. The following table furnishes the data supplied:

Test of Whey from vats.	Test of Whey drawn from tank when about a fourth empty.	Test of Whey drawn when tank was half to three-fourths empty.	Test of Whey from vats.	Test of Whey drawn from tank when about a fourth empty.	Test of Whey drawn when tank was half to three-fourths empty.
%	%	%	%	%	%
.23	.08	.15	.25	.17	.20
.28	.08	.15	.30	.15	.15
.25	.10	.25	.30	.07	.08
.30	.14	.15	.27	.13	.15
.30	.15	.16	.32	.22	.22
.27	.20	.20	.25	.14	.25
.30	.15	.15			

The whey, in the foregoing instances, was not pasteurized. It is evident that where this is not done much of the fat content of the whey rises to the surface. Furthermore, it means cans that are very hard to clean in the case of those who receive the last of the whey from the tanks, or else the loss of this fat in the draining and cleaning of the tanks, and it also means tanks that are more difficult to keep clean. It is a fair conclusion to draw, that where butter is not manufactured from the whey, the whey should be pasteurized, as this means an even distribution of the fat throughout the whey, sweeter whey, and cans and tanks that are easier to keep clean. Even where butter is manufactured we believe that the whey should be pasteurized.

B. *Reports from other Factories Manufacturing Whey Butter.*

Towards the close of the season we sent out report forms to several factories that were manufacturing whey butter, with the request that they be filled out and returned. The following are copies of reports received:

Month.	Lbs. of Milk.	Average % of Fat in Whey		Pounds of Butter Mfg.
		From Vat.	From Separator	
Factory No. 1:				
May	304,580	Not tested daily.	Not tested daily.	661
June	461,428			1,017
July	476,156			1,182
August	326,622			923
September	253,945			643
October	172,004			500
Factory No. 2:				
May	330,419	.24	.01	682
June	513,428	.23	.01	900
July	416,994	.23	trace	711
August	392,382	.23	.01	852
September	302,982	.21	trace	600
October	260,956	.22	.01	632
Factory No. 3:				
May	272,093	.17	trace	375
June	398,168	.19	"	558
July	428,281	.20	"	638
August	333,596	.20	"	649½
September	265,496	.25	"	636
October	199,492	.28	"	609

Note.—It is evident, from an examination of the reports given in the immediately preceding table, that the testing of the whey was not done daily, or the samples taken were not truly representative ones, or the testing was not entirely accurately done, or a correct average for the month was not obtained.

C. *Data re the Separating of Whey.*

The following table furnishes data as to the average rate per hour of separating the whey at the two factories in which our experiments were conducted:

Month.	Balderson.		Harrowsmith.	
	Rate of separating per hour, lbs.	Test of Whey from separator.	Rate of separating per hour, lbs.	Test of Whey from separator.
June	5,110	.038	4,890	.034
July	4,367	.027	3,771	.025
August	3,398	.02	3,214	.026
September	3,352	.02	3,747	.023
October	3,480	.015	.....	.....

At the Balderson factory the whey was separated at the temperature at which it came from the vats, or slightly below this, (94° to 98° F.), as a pump was used for elevating it, while at the Harrowsmith factory the whey, which was elevated from the cheese vats by means of an ejector, went to the separator at a much higher temperature—125° to 130° F.

The machines were run at an increased speed of fully 500 revolutions per minute.

IV. Conclusions.

1. As regards profit, it is quite conclusive that the manufacturing of butter from whey will pay in a reasonably large factory, one receiving not less than 10,000 pounds of milk per day, and having the average loss of fat in the whey.

2. However, it is not so certain that the manufacture of whey butter would prove so very profitable were the milk given the care that it should receive at the farm and skilfully manufactured into cheese. We know factories which have a very small loss of fat in the whey.

3. It is not at all likely that the manufacturing of whey butter will help to improve the quality of our cheese. On the contrary, it may injure it through encouraging carelessness on the part of the patrons and the maker.

4. It will not pay, in the case of small factories, to put in an equipment for the manufacture of whey butter. It is possible that several might combine and have one central butter plant, with separators at the different factories.

5. As to quality of product, we are forced to the conclusion that while butter of good quality *for immediate consumption* can be manufactured from whey, whey butter does not possess good keeping qualities. It is quite possible, of course, that some modification in the treatment of the cream from the whey might work an improvement in this respect.

6. To all who purpose manufacturing whey butter we would say, put in a good equipment, and by all means furnish sufficient and competent help.

In conclusion, I wish to acknowledge the valuable advice and assistance give me by Messrs. G. G. Publow, Chief Dairy Instructor for Eastern Ontario, and W. O. Walker, Lecturer in Chemistry at the School of Mining and the Eastern Dairy School. Also I would express my appreciation of the good work done by those who carried on the work at the different factories, and tender my thanks to those who so kindly examined and scored the butter for us from time to time.

COPY OF FORM USED IN RECORDING EXPERIMENTS IN THE MANUFACTURE OF WHEY BUTTER.

Experimental work in the making of buter from whey at ..... cheese factory.

Separator Report.

1. Weather conditions (temp., etc.) .....
2. Condition of milk .....
3. Weight of milk, lbs. .....
4. Weight of whey (80 per cent. of wt. of milk), lbs. .....
5. Per cent. of fat in whey from vats .....Lbs. fat.....
6. Per cent. of fat in whey from separator .....Lbs. fat.....
7. Pounds of fat in cream, from whey .....
8. Time separator was run .....hrs.....min.....
9. Rate of separating per hour, lbs. .....
10. Lbs. cream from separator .....Per cent. of fat.....Lbs. fat.....
11. Lbs. starter used .....Per cent. starter.....Per cent. of fat.....Lbs. fat.....
12. Lbs. cream with starter added .....Per cent. of fat.....Lbs. fat.....
13. Acidity of starter .....
14. Flavor of starter .....
15. Ripening temperature .....

Day of week and date of separating .....

Butter-Making Report.

16. Pasteurized or unpasteurized cream .....
17. Age of cream .....
18. Acidity of cream .....
19. Flavor of cream .....
20. Temperature of cream .....
21. Time churn was started .....
22. Time churning was completed .....
23. Length of time in churning .....
24. Amount of water added, lbs. .....Temp.....Quality.....
25. Weight of buttermilk, lbs. .....Test.....Lbs. fat.....
26. Number of times butter was washed .....
27. Temp. of wash-water .....
28. Size of granules .....
29. Condition of butter, (*a*) when churned .....(*b*) when worked.....
30. Ounces of salt per pound of butter .....Per cent. of salt.....
31. Kind of preservative used .....Per cent. .....
32. Number of times butter was worked .....
33. Revolutions of churn—1st working .....2nd working.....
34. Time between workings .....
35. Lbs. butter .....Over-run (per cent.) .....Moisture (per cent.).....
36. Pounds of butter from whey .....
37. Pounds of butter per 1,000 lbs. whey.....
38. Temperature of refrigerator .....

Day of week and date of churning .....

Report by .....

Remarks:—

EASTERN DAIRY SCHOOL.

Session of 1908-09.

Director.

G. A. Putnam, B.S.A. Department of Agriculture, Toronto.

Staff.

G. G. Publow ..... Acting Supt. and Lecturer in Cheese-Making.
J. H. Echlin ..... Instructor in Cheese-Making.
D. J. Cameron ..... Asst. " " "
Jas. Stonehouse ..... Instructor in Separators and Butter-Making.
J. Buro ..... Asst. " " "
W. W. Dool ..... Asst. Instructor in Butter-Making.
J. F. Singleton ..... Instructor in Milk-Testing.
J A. Craig ..... Instructor in Boilers, Engines and Pipe-fitting.
W. T. Connell, M.D., ... Lecturer in Bacteriology.
W. O. Walker, M.A., ... Lecturer in Chemistry.

The school opened as a creamery on November 24th, 1908, and was operated as such until January 1st, 1909. From January 1st, till March 23rd, the milk was purchased by the school, and from March 23rd, till April 10th, the school was, for the convenience of the patrons, again operated as a creamery.

The total registration during the long course was sixty-one, of whom nineteen took the final examinations, both practical and written, in cheese-making, the operation of cream separators, butter-making, milk-testing, boilers, engines and pipe-fitting, as well as the written examinations in Bacteriology and Dairy Chemistry. Of these nineteen students, seventeen were successful in passing the examinations in all subjects, seven obtaining first-class honors (75 per cent. and over), seven obtaining second-class honors (60 per cent. to 75 per cent.) and three obtaining a pass (40 per cent. to 60 per cent.).

Two lectures a week were devoted to Dairy Chemistry this session, which is double the time spent on this subject in former years. The students spent considerable time in practical laboratory work and undoubtedly have a better grasp of this important subject than the students of previous classes.

The principal new feature in the matter of cheese and butter-making was the use of the Mitchell-Walker moisture test. While not enough work has been done to give out any results, some interesting information has been secured.

The milk supply during the session has perhaps been the most satisfactory during the history of the school. The quantity delivered has been very uniform from day to day and the milk has arrived earlier and in better condition than in previous years.

The Instructors' Course opened March 30th, and continued till April 9th. Twenty-five Instructors registered for this course. Practical work was carried on in the operation of separators, butter-making, milk-testing and cheese judging. Lectures were given in Dairy Chemistry, Bacteriology and Sanitation, as well as cheese and butter-making. Considerable time was devoted to the discussion of problems connected with the work of instruction which proved both interesting and profitable to those in attendance.

G. G. Publow,
Acting Superintendent.

THE DAIRY SCHOOL IN CONNECTION WITH THE ONTARIO AGRICULTURAL COLLEGE, GUELPH, 1909.

Lecturers and Instructors, 1909.

H. H. Dean, B.S.A. ..Professor Dairy Husbandry.
R. Harcourt, B.S.A. .. " " Chemistry.
H. L. Fulmer, B.S.A. Demonstrator Dairy Chemistry.
S. F. Edwards, M.Sc. Prof. Dairy Bacteriology.
D. H. Jones, B.S.A. ...Lecturer Dairy Bacteriology.
A. McKay .....Chief Instructor Cheese-Making.
C H. Ralph..... Assistant Instructor Cheese-making.
R. W. Stratton ..... Instructor Hand and Power Cream Separators.
F. Dean .....Instructor Butter-making.
Geo. R. Taylor .....Instructor Milk and Cream Testing.
Miss Laura Rose .....Instructress Butter-making and Farm Dairy Cheese-making.
M. Robertson .....Instructor in Hand Separators and Milk Testing, Farm Dairy.
Geo. Travis ..... Instructor in Boilers, Engine, Piping, Soldering, etc.
F. G. Rice .....(Graduate Midland Dairy School, Eng.) Instructor in Soft and Fancy Cheese-making.

There were three short dairy courses held at the Ontario Agricultural College between January 2nd and April 10th, 1909. Our regular course of twelve weeks took place during January, February and March, which was attended by 47 students, of whom 31 wrote on the final examinations and passed. In addition to these about 25 short course girls from the Macdonald Institute took instructions in the theory and practice of dairying in the Farm Dairy. The week course for Instructors, and for those wishing instruction in milk and cream testing was attended by 23 students, some of whom had taken the twelve weeks course previously. The total registration for the short courses was 70, not including the girls from Macdonald Institute, nor a number who dropped in for a day or two during the term.

One of the older makers who was here for about two weeks thought it would be a good plan to have it generally known that cheese and butter makers may come to the Dairy School at any time during the course and pick up any information which may be available. This has always been understood to be the case, but to make it more clear, we extend to all cheese and buttermakers a hearty invitation to come to the Dairy School at any time; attend what lectures they see fit; ask all the questions they like; take up any special line to practical work in which they are interested—in a word, to make use of the lecturers, instructors, and equipment of the School to the fullest extent possible. We much prefer those who come and take the regular three months' course, but if this is not practicable, makers are welcome at any time to avail themselves of what information we may possess.

In view of the recent legislation requiring all head cheese and buttermakers to have Dairy School Certificates, or permits, after January 1st, 1911, we think it advisable that uniform certificates shall be issued by both Dairy Schools, and we have so recommended. It is altogether likely that the legislation referred to will cause an increased attendance at the Dairy Schools. Means will have to be provided before long to increase the building and equipment of the Dairy School at Guelph. The original dairy building is now used for cheese instruction and farm dairy work. In this building are located our steam boilers. As the building is one of the oldest on the College campus, it is almost beyond repair. The other building was erected in 1893 and is still in a fairly good state of repair. The lecture, coat and cloak rooms, office, milk-testing and creamery rooms are in this building. A

hand separator room and a laboratory for advanced students were fitted up in what was the live-stock class room. The live-stock lectures were given to the dairy classes in the pavilion of the College during the session of 1909.

A one month's course in soft cheesemaking was added to the regular course this year. This instruction was given during the month of February. We hope to be able to repeat this in 1910, as there seems to be a market for a limited amount of soft cheese at very profitable prices.

Dr. C. E. Thom, of the U.S. Department of Agriculture, who delivered an excellent lecture to the Instructors' and milk and cream testing classes on April 8th, said that he did not see how farmers could profitably patronize "hard cheese" factories. He pointed out that in the New England States there are practically no hard cheese factories now in operation except in one corner of the State of New York. His contention was that there is nothing in it for the milk producer, who does not realize more than the average price paid for milk at Cheddar cheeseries. This conviction is growing among our progressive, up-to-date farmers, and they are beginning to ask themselves what they can do as a substitute. In some sections they are patronizing milk condenseries; in others they are shipping milk or cream to towns and cities. How to make dairying more profitable to the man on the farm is one of the great problems which Dairy Schools and others must grapple with in the near future if the dairy business is to continue a prominent feature of agricultural operations in the Province of Ontario. The manufacture of the finest hard cheese with the least waste of food materials furnished in milk; the making of fine butter at least cost; the proper distribution of proceeds among patrons, together with investigations relating to such branches as milk condensing, whey butter, soft cheesemaking, etc., as possible additional sources of revenue to dairymen—all these are questions for Dairy Schools and dairy scientists to wrestle with.

It is the opinion of our Instructors that it would be wise in future to require of all students who expect to complete the full course, that they shall take up the full course of work instead of being allowed to select optional subjects as has been the case in the past. At their last meeting in 1909, the Instructors recommended that these optional courses be no longer allowed, and this recommendation will likely be adopted for the term of 1910.

In order to improve the business methods followed in creameries and cheeseries, and to get a set of books which shall be better adapted, more particularly for cream-gathering creameries, one session of the Instructors' Course was devoted to a discussion of these subjects. A committee composed of Messrs. Herns, Stratton and Robertson was appointed to look into the question and report at some future meeting.

On the whole, the Dairy Courses of 1909 were well attended, and the interest of the classes good, but we sometimes feel as if we were not getting at the men who would be most benefited by a course in the Dairy School. We trust that in the future we shall see an improvement in this respect.

H. H. Dean,
Prof. Dairy Husbandry.

CONSTITUTION AND BY-LAWS.

THE DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO.

Preamble.

This Association shall be known as the Dairymen's Association of Western Ontario, and shall have for its object the furthering of the interests of the dairy industry of Western Ontario.

(*a*) By holding an Annual Convention.

(*b*) By co-operating with dairymen in various sections, holding local dairy meetings, sending speakers to annual meetings, collecting, arranging and sending out to dairymen useful information.

(*c*) By co-operating in promoting the educational work of the Department of Agriculture of Ontario.

(*d*) By such other means as may be approved by the Minister of Agriculture.

(*e*) The Association year shall be the calendar year.

Constitution.

1. Membership in the Association shall consist of annual subscribers and the membership fee shall be decided by by-law.

2. This Association shall hold an annual meeting at such time and place as may be determined by by-law.

3. At such annual meeting a Board of Directors shall be elected, the number of directors, their representation of certain districts and their mode of selection being determined by by-law.

4. The members may elect as director a person not a member of the Association, but the person so elected must within ten days become a member, and he shall be entitled to act as director only after he has become a member of the Association.

5. The directors shall from among themselves elect a President and one or more Vice-Presidents.

6. The directors shall from among themselves or otherwise elect a Secretary and Treasurer or a Secretary-Treasurer.

7. The Board of Directors shall elect from among themselves an Executive Committee to consist of five members. The members of any Committee shall have power to add to their number when by so doing better work may be accomplished.

8. The Executive Committee shall have the right to conduct such business of the Association as the directors may specify, carry into effect the plan of work decided upon by the directors, and shall approve of accounts when necessary, plan and carry into effect such lines of work as may be beneficial to the Association and not of sufficient importance to justify the calling of the whole board together.

9. At each annual meeting the retiring officers shall present a full report of their proceedings and of the proceedings of the Association, a detailed statement of receipts and expenditures for the previous year and of the assets and liabilities duly audited; a copy of the said report, a statement of the receipts and expenditurs, a statement of the assets and liabilities, a list of the members and a list of the officers elected, and also such general information on matters of special interest that such Association has been able to obtain shall be sent to the Minister of Agriculture within forty days after the holding of such annual meeting.

10. The directors shall have full power to act for and on behalf of the Association, and all grants of money and other funds of the Association shall be received and expended under their direction subject nevertheless to the by-laws and regulations of the Association.

11. The constitution and by-laws of this Association must be approved by the Minister of Agriculture, and any change, alteration, or repeal of the same must be submitted to and approved by the Minister before it shall have force or effect.

12. Except as otherwise provided a vacancy occuring by the death or resignation or failure to qualify as member of any officer or director may be filled by the remaining officers of the Association; and it shall be the duty of such officers, and they are hereby empowered, to nominate and appoint a fit and proper person to fill the office for the

unexpired term of the person so dying or resigning; but in the event of the remaining officers being insufficient to form a quorum, or if, for any reason, a quorum cannot be obtained, then persons to fill the vacant offices shall be elected in the manner hereinafter provided.

13. In the event of an election of any directors of this Association being held at the time or place directed by by-law or being for any reason illegal and void, then the persons in office at the time when such officers or directors should have been elected shall continue to be, and shall be deemed to be the officers of such Association until their successors are legally appointed.

14. In the event of any such non-electing or illegal election a special meeting of the members of such Association shall be called as soon as practicable for the election of such directors. Such meeting to be called (in the manner provided by the by-laws of this Association for calling of annual meetings) by the President, or, in his absence or on his neglect by the Vice-President, or in the absence or on the neglect of the President and Vice-President, then by any three members of the Association, and at such meeting the election of officers shall take place and the persons elected shall thenceforth, until their successors are appointed, be and be deemed to be the officers of such Association.

By-laws.

1. The annual membership fee of this Association shall be one dollar or such sums as shall be determined by the Board of Directors from time to time.

Any person may become a member by giving or sending his name and address to the Secretary-Treasurer accompanied by such annual fee, and each member shall be entitled to a free copy of any publication issued by this Association in the year in which he is a member, and his name and address shall be forwarded to the Department of Agriculture for the receipt of the various publications sent out free from the said Department.

2. Each member shall annually upon payment of his annual subscription be supplied with a badge bearing the year of its issue thereon, which he shall wear when attending the annual meeting of the Association, and only those wearing badges for the year shall be entitled to vote.

3. The officers of this Association shall consist of a President, 1st Vice-President, 2nd Vice-President, 3rd Vice-President, Secretary-Treasurer and Directors.

4. This Association shall hold an annual meeting or such other meetings each year on such day or days at such place or places as may be decided upon by a majority vote of directors at any regular meeting of such directors.

5.—(*a*) At the annual meeting each year the directors, two auditors, and representatives from this Association to such Fair Associations and to such other organizations as may request representatives or to such other organizations as the members present at such annual meeting may decide upon to send representatives to, shall be elected by a majority vote of the members present in the manner hereinafter provided.

(*b*) One director shall be elected for each group of cheese factories and creameries, as grouped for instruction during the preceding year, and he shall reside in or near the group which he may represent, and may be called on by representatives of the Department of Agriculture to visit such cheese factories or creameries in the group which he represents, that may be found in an unsanitary condition.

(*c*) The Board of Directors shall always consist of ten members, provided, however, in case of there being less than ten groups of cheese factories and creameries in any year preceding the meeting at which election is held, then an additional number of directors sufficient to make up the required number of directors shall be elected, as hereinafter provided. No director so elected shall reside at or near the same place as any other director and no group shall have more than two directors during any year.

(*d*) At each annual meeting a nominating committee shall be appointed by a majority of the members present, who shall submit a report to such annual meetings, with such names as they may consider suitable for the offices of directors, auditors and representatives, and such report may be adopted by majority vote of the members present. Provided, however, that the report of the nominating committee may be amended and other name or names substituted for those in the nominating committee's report, and such amendment to be adopted only by majority vote of members present.

Duties of Officers.

1. The President shall preside at all meetings of the Association, Board of Directors and Executive Committees, and decide all questions of order, and make suggestions as he may deem necessary in the interest of the Association, and shall be *ex-officio* member of all committees.

2. It shall be the duty of the Vice-Presidents to aid and assist the President, and in his absence the powers and duties of the President shall devolve upon the first Vice-President, if the first Vice-President is also absent they shall devolve upon the second Vice-President, and if the second Vice-President is also absent they shall devolve upon the third Vice-President.

3. The President, Vice-Presidents, Secretary-Treasurer and Directors only are officers.

4. It shall be the duty of the Secretary-Treasurer to attend all meetings of the Association, the Board of Directors, and the Executive Committees to keep correct minutes of the same, furnish certificates of membership, notify all the directors of every regular meeting also special meetings of the Board, conduct all correspondence, issue all press and other reports, and prepare for publication the annual report, present at each annual meeting a full report of the previous year's proceedings of the Association, as well as a list of the members and officers elected, together with such general information on matters of special interest to dairymen as the Association may have obtained, and perform such other duties appertaining to his office as Secretary and as may be required by the Board or any provisions of Chapter 17, Statutes of Ontario, 1906, or any amendments thereto, and as Secretary-Treasurer shall be *ex-officio* member of all committees of this Association, and shall be the *ex-officio* Secretary of the said committees.

As Treasurer he shall receive and account for all moneys belonging to the Association, pay all bills and accounts, that have been approved of by the Board of Directors or the Executive Committee, and shall before entering upon the duties of his office give, if necessary, a bond which shall be approved of by the Board of Directors for the faithful performance of his duties as Treasurer and that he will duly account for and pay over all moneys which may come into his hands.

5. The Board of Audit shall be elected by majority vote of the members at the annual meeting, their duty shall consist of auditing the accounts of the Secretary-Treasurer and presenting a report to the Association and a duplicate of the same to the Minister of Agriculture for Ontario.

6. No officer nor director nor member shall disclose any motions, rulings, movers or seconders of motions or resolutions without the consent of the members of the Board of Directors present at such meeting, and no officer, director, or member shall furnish newspaper reports at variance with the official reports.

7. The person whose name is first placed on the committee shall be Chairman of the Committee. It shall be his duty to call the committee together and do all in his power to conduct successfully the work for which the committee is appointed.

8. The actual and reasonable expenses of the officers and directors, executive committees when attending an annual, board or executive meeting shall be paid by this Association. The Seretary-Treasurer is hereby authorized to pay such accounts on receipt of a detailed statement unless otherwise directed.

9. The actual and reasonable expenses of the Secretary-Treasurer shall be paid when attending all meetings connected with this Association, and in the discharge of the various duties devolving upon him in looking after the interests of the Association.

10. Not less than twenty-five members shall be a quorum to transact business for the Association. Not less than six members shall be a quorum at a Board of Directors' meeting, and not less than three members shall be a quorum at an executive meeting.

11. The officers or members of the Executive Committee or any committee may conduct by correspondence the duties assigned to said officers executive or committee by the constitution or by-laws or by the Association when such a course is deemed advisable by said officers, executive, or committee.

12. The director, or directors living nearest to the place where district meetings are to be held shall provide a place for the holding of such meeting and shall look after all preliminaries.

13. The officers of the Association shall be elected at the first meeting held by the Board of Directors except as hereinbefore provided for.

14. At least two weeks' notice shall be given of each annual meeting, naming the time and place of meeting, notice may be given through the press or by circular letter mailed to each member.

15. A directors' meeting shall be called by mailing at a reasonable time before the date of meeting to each officer or director a notice of meeting as above provided.

16. An Executive Committee meeting shall be called by mailing at a reasonable time before the date of meeting to each member of committee a notice of meeting.

17. Any amendments, alterations or repeal of a by-law shall be made in writing and brought before the annual meeting, and shall require a majority vote of the members present at such meeting for the adoption of the same.

Order of Business.

1. Reading minutes of previous meetings.
2. Reports of officers.
3. Reports of committees.
4. Unfinished business.
5. Accounts.
6. New business.
7. Adjournment.

Order of Meetings.

1. Except by permission of the presiding officer no member or other person shall speak except to ask a question or to introduce a motion or speak to the same.

2. In the discussion following the introduction of a subject no person shall speak more than twice nor for a longer time than five minutes except by a vote of the meeting.

3. When a question is under discussion no motion shall be in order except the following (1) to adjourn, (2) to postpone, (3) to amend. These motions take precedence in the order named and the first two shall be decided without debate.

4. Before the vote is taken on any motion or amendment, the President shall ask, "Is the meeting ready for the question"?

5. The motion shall not be put so long as any member desires to speak and is in order.

Approval of Minister of Agriculture.

The foregoing constitution and by-laws shall come into effect as soon as the same shall be approved by the Honorable the Minister of Agriculture for the Province of Ontario.

Approved by Minister of Agriculture on November 28th, 1908, and confirmed by the Association on January 13th, 1909.

THE DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO.

Preamble.

1. This organization shall be known as the Dairymen's Association of Eastern Ontario, and shall have for its object the furthering of the interests of the dairy industry in all its branches, in that part of the Province.

(*a*) By holding an Annual Convention for the consideration of questions relating thereto.

(*b*) By co-operating in every way possible with the dairymen in the various dairy sections, and by holding local dairy meetings therein.

(*c*) By collecting, arranging and disseminating useful information.

(*d*) By co-operating in promoting the educational work of the Ontario Department of Agriculture.

(*e*) And by such other means as may be approved by the Minister of Agriculture.

Constitution and By-laws.

1. The membership thereof shall consist of annual subscribers, of one dollar each, or such other sums as shall be dtermined by the Board of Directors, but other persons who have been appointed by the Board of Directors from year to year, may be placed on the list of Honorary Members without the payment of such annual fee.

2. The annual meeting of the Association shall be held at such time and place as may be determined by the Board of Directors, and at such annual meeting a Board, consisting of eighteen directors, shall be elected by the members thereof to transact the business of such Association during the next ensuing year, or until their successors in office are appointed.

3. The Association year shall be the calendar year.

4. The directors shall elect from among themselves an Executive Committee of seven, which shall have the right to conduct such business of the Association as the directors may specify.

Officers.

5. The officers shall consist of President, First Vice-President, Second Vice-President, Secretary and Treasurer and a Board of Audit composed of two members.

Duties of Officers.

6. The President shall preside at all meetings of the Association, decide all questions of Order, make such suggestions as he may deem necessary in the interests of the Association, and shall be *ex-officio* member of all committees.

7. The Vice-President, or in his absence, the Second Vice-President, shall perform all the duties of the President in his absence.

8. The Secretary shall keep all the records of the Board of Directors, furnish certificates of membership, notify all the directors of every regular or special meeting of the Board, keep accurate minutes of the transactions of such meetings, conduct all correspondence of the Board as a body, present at each annual meeting a full report of the previous year's proceedings of the Association, as well as a list of the membership and the officers elected, together with such general information on matters of special interest to dairymen as the Association may have obtained, and perform such other acts appertaining to his office as Secretary as may be required by the Board.

9. The Treasurer shall receive and account for all moneys belonging to the Association, pay all bills and accounts that have been approved of by the Association's Executive Committee, and shall, before entering upon the duties of his office, enter into bonds with security, which shall be approved of by the Board of Directors.

10. The Board of Audit shall consist of two members, one of which shall be elected by the vote of the membership at the annual meeting and the other shall be appointed by the Board of Directors.

Their duties shall consist of auditing the accounts of the Treasurer and presenting a report to the Association and a duplicate of the same to the Minister of Agriculture.

11. The local dairy meetings shall be held at such times and places as a committee, composed of the President, Secretary, Chief Instructor and the Director of Dairying, shall determine.

The director or directors living nearest to the place where such meetings are to be held shall provide a place for the holding of such meetings and shall look after such preliminaries.

12. The officers of the Association shall be elected at the first meeting held by the Board of Directors, except as hereinbefore provided for.

13. The foregoing by-laws shall come into effect on the eleventh day of January, A.D. 1907, or as soon thereafter as the same shall be approved by the Honourable the Minister of Agriculture for Ontario.

Approved by the Minister of Agriculture, April 30th, 1907.

AN ACT TO REGULATE THE MANUFACTURE OF DAIRY PRODUCTS.

[*Assented to April 13, 1909*].

His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

1. This Act may be cited as "The Dairy Products Act."

2. In this Act the word "Minister" shall mean the Minister of Agriculture, and the word "Inspector" shall mean any inspector appointed under "The Milk, Cheese and Butter Act."

3. In this Act a "Creamery" shall mean any place to which is brought the milk or cream from the herds of three or more persons for the purpose of being manufactured into butter for public sale; and "Cheese Factory" shall mean any place to which is brought the milk from the herds of five or more persons for the purpose of being manufactured into cheese for public sale.

4. On or before the first day of January, 1910, the owner, proprietor or manager of every creamery, cheese factory, milk condensory, milk powder factory or other establishment for the manufacture of milk products shall register with the Minister of Agriculture, on forms to be supplied by him, stating the nature of business carried on, the exact location of the same, and such other information as to ownership as may be required by the Minister, and an exact record of all such registrations shall be kept by the Minister and shall be open to public inspection.

5.—(1) On and after the first day of January, 1910, no person or persons, company or corporation shall carry on business in a creamery, milk condensory, milk powder factory or the manufacture of any form of dairy products in any building or place not recorded in the list referred to in section 4, without first applying to the Minister of Agriculture and receiving from him permission to do so, and this permission shall be granted only after a report upon the same has been filed, signed by an inspector.

(2) Refusal to grant permission under this section may be based upon lack of proper equipment, or unsanitary conditions.

(3) An appeal from the decision of the Minister may be made by the applicant to the Lieutenant-Governor in Council whose decision shall be final.

6. Upon the report of an inspector that any creamery, cheese factory, milk condensory, milk powder factory or other place for the manufacture of dairy products is not in a satisfactory sanitary condition or is inadequately equipped for the manufacture of dairy products, the Minister may order the owner or manager of the same to close it down forthwith and it shall be kept closed until such time as the inspector reports that it has been put into a satisfactory sanitary condition and is adequately equipped for the manufacture of dairy products.

7. On and after the first day of January, 1911, no person shall act or be allowed to act as chief maker in any creamery or cheese factory who does not hold a certificate of qualification from the Dairy School of the Ontario Agricultural College or from the Eastern Dairy School.

(*a*) In place of the above certificate of qualification a special permit may be issued at any time by the Minister upon the recommendation of an inspector on the general grounds of experience and competency.

8. Any person violating the provisions of this Act shall, on conviction thereof, be liable to a fine not exceeding $10, and, upon refusal to pay the same, shall be liable to imprisonment for a period not exceeding thirty days.

THE MILK, CHEESE AND BUTTER ACT.

(As amended in 1909).

His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

Standard of Milk in Creameries.

1. This Act may be cited as "The Milk, Cheese and Butter Act."

2. (*Repealed in 1909*).

3. The owners or board of management of any creamery in the Province of Ontario, may make such rules and regulations as may be advisable for the due carrying on of the business of the creamery.

4. The patrons of all creameries may be required to subscribe their names to such rules and regulations, and the rules and regulations shall be binding on the patrons, owners and board of management who have so subscribed.

Prevention of Frauds.

5. It shall be lawful for the owner or manager of a cheese or butter manufactory to require the owner or custodian of any cow or cows whose milk is being bought for, or supplied or sent to, the manufactory, to submit such cow or cows at his farm or other premises where such cows are usually kept, to such milk test, by persons named by such owner or manager, as may be necessary for the said persons to ascertain the quantity and quality of the milk of such cow or cows, on any day, and at such time on any such day as may be appointed by said owner or manager, and in case the owner or custodian of the cows refuses to so submit them, or obstructs in the execution thereof the persons engaged in making the milk test, or interrupts the test, or interferes in any way with the test, or the application of its result, he shall, on complaint before any Justice or Justices of the Peace, forfeit and pay for every such offence a sum of not less than $10 nor more than $100, in the discretion of the Justice or Justices of the Peace who may hear such complaint, together with the costs of the prosecution, if so ordered, and in default of payment of the penalty and costs, shall be liable to be committed by the convicting Justice or Justices of the Peace, to the common gaol of the county, with hard labour for any period not exceeding six months or until said penalty and the costs of enforcing same are sooner paid.

6. It shall be lawful for the owner or manager of any cheese or butter manufactory who suspects any person of selling, supplying, sending or bringing milk to the manufactory, of any offence under this Act, to enter upon or to appoint some person or persons to enter upon, and such appointed person may enter upon the premises of the suspected person, with or without notice, and take samples of milk from the cow or cows from which the supposed offender was or had been immediately before then procuring the milk or part of the milk so sold, supplied, sent or brought as aforesaid; and any such suspected person who obstructs or refuses to permit the taking of any such sample shall, on conviction thereof, be liable to a penalty of not less than $10 nor more than $50 with costs of the prosecution, and in default of payment thereof, shall be liable to be imprisoned in the common gaol of the county in which the offence has been committed for a period not exceeding three months with hard labour.

7. No person shall sell or offer for sale in any city, town or incorporated village, and no person shall sell or supply under contract to any person in any city, town or incorporated village, and no person shall sell, supply, bring or send to a cheese or butter manufactory, or the owner or manager thereof, milk diluted with water, or in any way adulterated, or milk from which any cream has been taken, or milk commonly known as "skimmed milk," or milk in which any preservative is contained, without distinctly notifying in writing, the owner or manager of such cheese or butter manufactory, or the person or persons to whom it is sold in cities, towns or incorporated villages, that the milk so sold, supplied or brought to be manufactured or otherwise disposed of, has been so diluted with water, or adulterated, or had the cream so taken from it, or become milk commonly known as "skimmed milk," or has had a preservative added to it, as the case may be.

8. No person who, in the course of his business agrees to sell, supply, bring or send to any cheese or butter manufactory, or the owner or manager thereof, to be manufactured, the milk of any cow or cows, shall in the course of such dealing and business, keep back any part of the milk of such cow or cows without distinctly notifying in writing, the owner or manager of such cheese or butter manufactory what portion of the milk he has so kept back.

9. Notwithstanding anything contained in this Act, no person shall be subject to any penalties under this Act for selling in any city, town or incorporated village milk from which any of the butter fat or cream has been removed, provided the milk so sold or offered for sale is advertised as "skimmed milk," and the person to whom the milk is sold is informed that the same is "skimmed milk."

10. No person shall sell, supply, bring or send to a cheese or butter manufactory, or owner or manager thereof, to be manufactured, any milk that is tainted or partly sour without distinctly notifying, in writing, the owner or manager of such cheese or butter manufactory of such milk being tainted or partly sour.

11. No person supplying milk or cream to a cheese factory or creamery, or for sale in cities, towns or incorporated villages, shall keep his dairy, milk house, milk stand, or any vessels or equipment used for the storing or the carrying of milk or cream, in an unclean or unsanitary condition.

12.—(1) Every cheese factory and creamery manufacturing butter or cheese for public use or sale, and the premises upon which milk or cream is offered for sale and the surroundings of every such cheese factory and creamery, and premises shall be kept in a clean and sanitary condition, and all the water used therein for the manufacture of any dairy products must be clean and pure.

(2) The owner or manager of any cheese factory or creamery or premises upon which milk or cream is offered for sale refusing or neglecting to observe the provisions of this section after being warned or advised by a dairy inspector, shall, upon conviction thereof before any Justice or Justices of the Peace, forfeit and pay a sum of not less than $50 nor more than $200, together with the costs of prosecution, and in default of payment of such penalty and costs shall be liable to be committed to the common gaol of the county with hard labor for a period not exceeding six months.

13. Upon the recommendation of the Minister of Agriculture, the Lieutenant-Governor in Council may appoint one or more persons as inspectors for the enforcing of the provisions of this Act, who shall be known as Dairy Inspectors. The Lieutenant-Governor in Council may determine the remuneration to be paid to such inspectors.

14.—(1) All dairy inspectors appointed under this Act shall have free access and admission to all cheese factories and creameries and the premises upon which milk or cream is offered for sale located within the Province and to all lands adjoining the same, and to the premises of all persons supplying milk or cream to any cheese factory or creamery, or for sale in cities, town or incorporated villages; they shall also be empowered to take and test samples of milk found in cheese factories or creameries or in the possession of milk dealers having the same for sale in cities, towns or incorporated villages, or in transit between producers and cheese factories and creameries, between producers and dealers or between dealers and consumers in cities, towns or incorporated villages; and they shall have the right to take and test samples of milk found upon the premises of producers supplying milk to cheese factories or creameries or for sale in cities, towns or incorporated villages, and may take and test samples from cows which have been producing milk to be sold to cheese factories or creameries or to be delivered for sale in cities, towns or incorporated villages, and any person refusing admission to the same or offering obstruction to the work of inspection or the taking of samples or testing of same shall be subject to the penalties provided in section 16.

(2) Every inspector appointed under this Act shall have the right at any time to take samples for testing any product manufactured in any cheese factory, creamery, milk condensery, milk powder factory or other establishment for the manufacture of milk products for sale. (*New in 1909*).

15. Every inspector appointed under this Act shall make such reports and in such form as the Minister may direct.

16.—(1) Any person who, by himself, or by his servant or agent, violates any of the provisions of sections 7, 8, 10 or 14 of this Act, upon conviction thereof before any Justice or Justices of the Peace, shall forfeit and pay a sum of not less than $5 nor more than $50, together with the costs of prosecution, in the discretion of the Justice or Justices, and in default of payment of such penalty and costs, shall be liable to be committed to the common gaol of the county, with hard labor, for any period not exceeding six months, unless the said penalty and the costs of enforcing same are sooner paid.

(2) For the purpose of establishing the guilt of any person under the said sections 7 or 8 of this Act, it shall be sufficient *prima facie* evidence to show that such person, by himself, his servant, or agent, sold, supplied, sent or brought, to be manufactured, to any cheese or butter manufactory, milk substantially below the standard of that actually drawn, or by the accused represented as having been drawn from the same cow

or cows within the then previous or subsequent two weeks, provided the comparison or test is made by means of a lactometer and Babcock Tester, or by some other adequate means of making the comparison.

(3) The said sections 7, 8 and 10 shall not apply where the person charged with the offence proves to the satisfaction of the Justice or Justices of the Peace that the alleged offence was committed by some person or persons other than a member of the family of the person charged with the offence or was committed by some person or persons other than his servant or agent, and also that the offence was committed without his knowledge or consent.

(4) In any complaint made or laid under said sections 7, 8, 10 or 14 of this Act, and in any conviction thereon, the milk complained of may be described as deteriorated milk, without specification of the cause or mode of deterioration, and such description shall be a sufficient description of the offence to sustain a conviction, and in any complaint, information or conviction under this Act the matter complained of may be declared, and shall be held to have arisen within the meaning of "The Ontario Summary Convictions Act," at the place where the milk complained of was to be manuafctured, notwithstanding that the deterioration thereof was effected elsewhere.

17. Any pecuniary penalty imposed by the preceding section in respect of selling, supplying or bringing milk to a cheese or butter manufactory, shall, when recovered, be payable one-half to the informant, and the other one-half to the owner, treasurer or president of the manufactory to which the milk was sent, sold or supplied for any of the purposes aforesaid in violation of any of the provisions of this Act, to be distributed among the patrons thereof in proportion to their respective interests in and profits thereof.

18.—(1) Any butter or cheese manufacturer who knowingly and fraudulently uses, or directs any of his employees to use for his or their individual benefit, any cream from the milk brought to any cheese or butter manufactory, without the consent of all the owners thereof, shall, for every offence, forfeit and pay a sum not less than $1 nor more than $50, in the discretion of the Justices before whom the case is heard.

(2) Any two or more Justices of the Peace, having jurisdiction within the locality where the offence has been committed, may hear and determine such complaint upon the oath of one or more credible witnesses, and shall have power, in case the penalty and costs awarded by them are not forthwith paid upon conviction, to levy the same by distress and sale of the goods and chattels of the offender, by warrant under their hands and seals or the hands and seals of any two of them, and the penalty, when recovered, shall be paid over by such Justices, one-half to the person complaining, and one-half to the treasurer of the municipality, district or place where the offence has been committed; and in default of payment or sufficient distress, the offender may, by warrant signed and sealed as aforesaid, be imprisoned in the common gaol for a period not less than one day nor more than twenty-five days, at the discretion of such Justices, or any two of them, unless such penalty, costs and the charges of commitment are sooner paid.

(3) Any party aggrieved by such fraudulent conduct as aforesaid may at his election sue the offender in any Civil Court of competent jurisdiction, and recover from him the amount of damages sustained, and levy the same with the costs according to the ordinary practice of the Court in which such action is brought.

19. No Justice or Justices having any pecuniary interest in a cheese or butter manufactory as aforesaid, shall hear or determine any complaint under this Act.

20. Chapter 251 of the Revised Statutes of Ontario, 1897, and amendments thereto are repealed.

DAIRY INSTRUCTION IN THE PROVINCE OF ONTARIO.

By George A. Putnam, Director of Dairy Instruction for Ontario.

[Written for "O. A. C. Review," April, 1909].

While the present system of sending specialists in cheese-making and butter-making to all factories and creameries in the Province, throughout the season of manufacture, for the purpose of assisting the makers in producing a more uniform and better quality of cheese and butter, inspecting the factories for sanitary condition, and advising the patrons in the care and handling of the raw material, is a development of recent years, we find that, as far back as 1879, the Dairymen's Association of Western Ontario employed Professor L. B. Arnold, of New York State, to go from factory to factory that he might assist the makers in introducing methods of manufacture with the view of improving the quality and establishing a uniformity in the product. Professor J. B. Harris, of Antwerp, New York, was engaged by the Dairymen's Association of Eastern Ontario, to carry on similar work in 1880, 1881 and 1882. In 1883 his field of labor was in the western portion of the Province, while Messrs. Whitton and Bissell acted as instructors in Eastern Ontario.

The late Hon. Thos. Ballantyne who did more to advance the dairy industry than any other individual in Ontario in the eighties, for a year or two years, at least, bore the expense of sending a specialist in cheese-making to visit a number of factories in Western Ontario, believing that the ultimate success of the industry was largely dependent upon quality and uniformity, which could best be secured by sending an up-to-date man from factory to factory throughout the season of manufacture. At the annual meeting of the Western Association, held February, 1884, the Hon. Mr. Ballantyne stated:—"I know some places where the goods were of the poorest description, and the maker was desirous of having Professor Harris come, and the cheese were much better from the first day of Professor Harris' visit to the factory until the end of the season. If our funds would admit of it, it would be a good thing to employ a number of instructors so that they could be all the time about the factories; it would pay."

While it was considered wise on the part of the officers of the Dairymen's Associations to secure instructors from New York State during the years 1879-1883 inclusive, it is a matter of congratulation to Canadians that it has not since then been thought necessary either by the Associations or the Department of Agriculture to go outside of the Province for specialists in this branch of dairy education. On the other hand, many of our best men have been sought as commissioners, teachers and instructors in dairying by many States of the Union, the British Isles, New Zealand, Australia and other countries.

Dairy instruction was carried on by the Dairymen's Associations to a greater or less extent and with much benefit to the industry, throughout all the years from 1879, until in 1901 we find eight men employed by the Association of Eastern Ontario and three in Western Ontario. The creameries were also receiving instruction at this time. We find in that year for the first time that the work of the instructors was recognized by the patrons as educational rather than that of detectives. The time devoted to the patrons was for the purpose of instructing them in the care and handling of the milk rather than in an endeavor to detect skimming, watering or the keeping of strippings for home use. This was a decided step in advance. In 1902, three men were employed by the Association in Eastern Ontario and nine in Western Ontario. In this year two groups or syndicates were formed, and a man placed in direct charge of a limited number of factories. This enabled him to make periodical visits and to establish a uniformity and improvement which had not been manifest up to this time. The experiment proved so successful that in the following year, 1903, we had for the first time a chief instructor for both Eastern and Western Ontario, whose duty it was to keep in close touch with the instructors employed by the Associations and to direct them along uniform lines, thus establishing a system covering practically the whole of the Province. The two Chief Instructors were officially appointed by the Provincial Department of Agriculture.

In 1904 the instruction work assumed such large proportions that the Department of Agriculture decided to relieve the Dairymen's Associations of the financial burden and made an appropriation for the payment of thirty-two regular instructors and two chief instructors, one for Eastern Ontario and one for Western Ontario. Factories which desired assistance were required to pay ten dollars to the Department of Agriculture for the services rendered. This did not cover quite one-third of the total outlay of over $23,000 for the season. The factories were arranged in syndicates or groups and each instructor was held responsible through the chief instructor for the work in his district. The work was better arranged than ever before and improvements were

more marked. In addition to the regular work of instruction 136 meetings were held during the summer months. At these meetings the instructors were enabled to give the producers information as to the best methods of handling their milk, the necessity for an improved water supply, etc. The improvements in factories during the season amounted to $158,000, many of these being made at the suggestion of the instructors.

In 1905 we find thirty-seven instructors with two chief instructors. Eight hundred and eleven factories were included in the groups and two hundred and thirty-nine factory meetings were held. The Dairy Schools at Kingston and Guelph gave a ten-days' course, specially for the benefit of the instructors. This enabled them to receive instruction upon the most improved methods and to carry it on to the makers throughout the country, and tended to greater uniformity.

The Provincial Legislature, in 1906, passed an Act requiring that all cheese factories and creameries be kept in a clean and sanitary condition and made provision for the appointment of inspectors upon the recommendation of the Minister of Agriculture. Accordingly two men were appointed to enforce this law, and the result was that much improvement was made in whey tanks, drainage, and the general surroundings of factories. We also see in this year an increased number of curd tests being made with the object of tracing undesirable flavors which developed in the manufacture of the cheese.

The season of 1907 witnessed another decided step in advance. Up to this time the factories desiring the services of instructors were required to pay a portion of the expenses connected therewith. The weakness in this system was that the factories most in need of assistance and those which could not afford to engage a high-priced maker were the ones which did not receive assistance. It was therefore decided by the Department to assume the whole financial responsibility and give instruction to all factories and creameries without making any charge whatever. This placed the instructors in an independent position which they did not enjoy before. It can easily be seen that when the factorymen were paying a portion of the expenses of instruction, that the instructors hesitated to make demands or to offer suggestions which they would otherwise have made had they been entirely independent. Then again the poorer factories received the same attention as the larger and more prosperous ones, with the result that a greater uniformity was established than was found possible under the old system.

In Eastern Ontario one hundred and seventy-eight factories received instruction for the first time in 1907, and a few factories in Western Ontario which had not up to this date been included in the instruction work were visited for the first time. We find one thousand one hundred and eighty-two factories and ninety-nine creameries receiving regular visits from the instructors and a definiteness of purpose and uniformity which had not existed previously.

Regular instructors were all clothed with the power of sanitary inspectors, which proved of great assistance in having the sanitary conditions of the factories improved. Heretofore they had been in a position only to *make suggestions* and *requests*. Now they were in a position to *demand* those improvements and alterations which were necessary to place the premises in a sanitary condition.

Up to this time the instructors devoted considerable attention to testing milk, and in some cases making prosecutions for the adulteration of milk. At the request of the Department the Western Association employed a man to look after this work. The instructors co-operated to a certain extent, in the gathering of evidence, but the work of prosecuting was left to the special official. This still further strengthened the position of the instructors, especially so far as the patrons were concerned. The same system of prosecution was adopted by the Eastern Association in 1908, with most satisfactory results. The magistrates throughout the country evidently appreciate the action of the association in dealing with the adulteration of milk in this manner, and are in the majority of cases imposing substantial fines. There is a marked decrease in the percentage of adulterated samples, and it is hoped and expected that the coming season will see a still further decrease.

It is generally admitted by those in close touch with the dairy industry that the method of instruction which we now have in Ontario, the appointng of special officials to deal with the adulteration of milk, and the holding of factory meetings and district dairy meetings, has resulted in a greater improvement during the past two years than in the preceding several years.

APPENDIX

TO

ANNUAL REPORTS

OF THE

DAIRYMEN'S ASSOCIATIONS

OF THE

PROVINCE OF ONTARIO

LIST OF CHEESE FACTORIES AND CREAMERIES

IN OPERATION IN ONTARIO DURING THE SUMMER OF 1909.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO :
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1909.

Printed by WARWICK BROS. & RUTTTER, Limited,
TORONTO

CHEESE FACTORIES AND CREAMERIES IN ONTARIO.

The list of factories and creameries presented herewith, together with officers thereof and makers therein, has been compiled from the information received from Dairy Instructors during the early part of the season of 1909.

It will be noticed that in addition to the name and location of each Cheese Factory and Creamery, the names and addresses of Proprietor, Secretary and Maker are given. In the case of Joint Stock Companies, indicated thus, x, the President's name is given. In all other cases the name appearing in this column is that of the proprietor.

In all cases, except where noted, the address of the Secretary and Maker is the same as that of the President or Proprietor.

Persons receiving copies of the list are requested to notify the Director of Dairy Instruction, Parliament Buildings, Toronto, as to changes in name of factory, or error in list of officers. The Department will also be pleased to receive particulars regarding any factories that may not appear upon this list, and also in regard to any of the factories appearing on this list that are not now in operation.

For convenience the Province has been divided into Eastern and Western Ontario, and the Counties in each part are arranged in alphabetical order. These counties are divided into townships, which are arranged in each County in alphabetical order. The factories appear under the name of the Township in which they are located in alphabetical order.

It is encouraging to receive reports from the wholesale merchants in Montreal and other places to the effect that the quality of the dairy goods during the present season is of a higher standard than in previous years.

The Provincial Department of Agriculture is spending a good deal of money in the interest of dairy education and instruction, and is encouraged in this work by the response on the part of the producers and factorymen in keeping their premises in an up-to-date sanitary condition and in handling the milk in a cleanly, careful manner. Greater efforts than ever are being put forth by the producers to increase the average production of their dairy cows. A good deal of pure bred blood is being introduced throughout the Province and a number of farmers are using the weigh scales and Babcock Test as a means to asssist them in weeding out unprofitable animals.

Provision has been made for the registering of all factories and granting of certificates to makers, the former to come in operation at the beginning of 1910 and the latter at the beginning of 1911. All this legislation and expenditure of funds is bound to exert a helpful influence upon the dairy industry of the Province. We are asking for the co-operation of the producer, maker and proprietor.

We have 1177 cheese factories in operation in the Province during the present season and 97 creameries.

During the season of 1908, 1,661,039,751 pounds of milk were delivered at cheese factories from which 120,624,436 pounds cheese were manufactured with a total cash value of $13,106,919.95. The creameries of the Province manufactured 9,895,109 pounds butter with a total cash value of $2,355,170.43.

G. A. PUTNAM,
Director of Dairying.

DAIRY BRANCH,
DEPARTMENT OF AGRICULTURE.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.

Addington County.

Camden East, Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Camden East	Hayden & McGinnis Camden East	H. McGinnis	H. McGinnis.
Centreville	F. C. Gerow Centreville.	W. Wager	F. C. Gerow.
Croyden	W. J. Paul Tamworth.	Jas. Close, Croyden	Geo. Barrigar, Croyden.
Enterprise	Thos. Clancy Enterprise.	Robt. Cox	P. J. Murphy.
Moscow	Fred. Johnston Moscow.	E. Vanluven	Fred. Clark.
Newburgh	Geo. Cleall, Napanee	Geo. Cleall	Lewis Innes, Newburgh.
Whitman's Creek	J. D. Wagar & Son Enterprise.	Jno. Dillon Carmanville.	G. Connor, Carmanville.

Denbigh Township.

Jackson's	G. W. Jackson Vennacher.	Simon Ball	Thos. Love.

Sheffield Township.

Clareview	W. J. Paul Tamworth.	Chas. Jones	Robt. Waters, Clareview.
Fifth Lake	T. Clancy Enterprise.	Robt. Cox	Jno. Kellar, Fifth Lake.
Sheffield	W. J. Paul Tamworth.	Chas. Jones	H. Melbourne.
Tamworth	W. J. Paul Tamworth.	Chas. Jones	Findley Bell.

Carleton County.

Fitzroy Township.

x Diamond	W. J. Baird Kinburn.	W. A. Ross	W. Lowery.
Elm Dale	W. J. Ragsdale Smith's Falls.	J. J. Wilson. Marathon.	F. Ireland, Marathon.
x Harbor	W. J. McBride, Fitzroy Harbor.	W. J. Campbell	W. A. Stewart.
x Kinburn	T. Armstrong Kinburn.	Thos. Geddes	R. Lowery.
x Union Pride	T. G. Wilson Arnprior.	Miss Meedam	J. Kelly.
Victoria	Carl Stevenson Kinburn.	H. Lunney, Antrim	Frank Dredge.

Gloucester Township.

Blue Bell	T. Brown, Edwards	Mrs. R. Piper	F. Higney.
Eastman's Springs	Orr & Ramsay Carlsbad Springs.	O. Hudson	Jno. Patrick.
Edwards	J. D. McPhail Russell.	Wm. Switzer Edwards.	E. Daney, Edwards.
Hawthorne	Jno. Alexander Hawthorne.	Chas. Moxley	Mr. Whimsette.
Kidd's No. 2	Ed. Kidd North Gower.	Mr. Oliver Manotick.	J. Bennett, Manotick.
Kidd's No. 3	Ed. Kidd North Gower.	A. Gamble Manotick.	Geo. Menor.
Maple Leaf, A	H. Hardy Bowesville.	Jas. Burt	Jos. Leroux.
Russell Road	R. A. Bickerton Ramsayville.	R. A. Bickerton	Jas. Atcheson.
Starlight	C. Hardy Bowesville.	Wm. Purdy Blackburn.	G. Armstrong, Blackburn.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

CARLETON COUNTY.—*Continued.*

Goulburn Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Ashton Union	J. H. Singleton, Smith's Falls.	Lloyd Hill, Ashton	Geo. Brayman, Ashton.
Eager's No. 20	Eager & Hutton, Morrisburg.	Wm. Eager, Morrisburg.	Jno. Cobey, Stittsville.
Eager's No. 21	Eager & Hutton, Morrisburg.	Wm. Eager, Morrisburg.	R. Henderson, Richmond.
Golden	J. H. Singleton, Smith's Falls.	S. Cassedy, Munster.	Wes. Moore, Munster.
x Independent	J. Smith, Stanley's Corners.	G. Flewellyn, Stittsville.	R. P. White.
Pure Gold	T. Scott, Stapleton.	J. Neelan, Dwyer Hill.	F. C. Chaffe, Dwyer Hill.

Gower, North, Township.

Carsonby	W. G. Godkin, Carsonby.	J. A. Waddell	Wm. Packwood.
Kidd's No. 1	Ed. Kidd, North Gower.	Jas. Wallace	T. H. Hicks.
Kidd's No. 5	Ed. Kidd, North Gower.	M. Brown, Patterson's Cors.	L. Anderson.
Olive Dale	Scott & Boyd, Balderson.	Miss Flo. Grier, Kerr's.	Alex. Scott, Kerr's.
Rockdale No. 1	Fred. Dilworth, North Gower.	Alex. McLeod	H. T. Waters.

Huntley Township.

Huntley Centre	J. S. Ragsdale, Huntley.	Horace Downey	J. S. Ragsdale.
Kidd's No. 4	Ed. Kidd, North Gower.	Geo. A. Moore, Carp.	Thos. Levere, Carp.
Maple Leaf	McGarry & Lynch, Powell.	J. J. Manion	J. J. Lynch.

March Township.

x Carleton Model	Geo. Armstrong, South March.	J. M. Argue	J. A. Young.
Gold Medal	S. S. Cheetham, Gananoque.	J. J. Younghusband, Dunrobin.	J. Kelly, Dunrobin.
x Hazeldean	Thos. Wall, Hazeldean.	J. A. Cummings	H. Ireland.

Marlborough Township.

Goodstown	Freeman Brown, Farmers' Union.	W. J. McBride, Malakoff.	O. Wallace, Malakoff.
Green Valley	F. H. Lewis, Bridge View.	Wm. Henton	F. H. Lewis.
Malakoff	Godkin Bros., Carsonby.	R. A. Morrison, Malakoff.	F. M. Murray, Malakoff.
x North Rideau	Jno. Hornett, North Rideau.	Gilbert Davidson	S. Elliott, Kemptville.

Nepean Township.

Eager's No. 26	Eager & Hutton, Morrisburg.	Wm. Eager	Fred Pike, Merivale.
x Goodwood No. 1	Chas. McKenney, Fallowfield.	J. Troy	A. J. Wiltse.
Jockvale	P. Madden, Jockvale.	Thos. Dalney	Chas. Hollester.
x Keystone	P. J. Houlahan, Jockvale.	P. Quinlan	S. H. Bishop.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

CARLETON COUNTY.—*Continued.*

Nepean Township.—*Continued.*

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Minto	N. E. Ronan, Russell.	P. J. Moloughney, Manotick.	J. Lalond, Manotick.
Twin Elm	W. G. Godkin, Carsonby.	Jno. Gamble, Twin Elm.	N. Mains, Twin Elm.

Osgoode Township.

Alpine No. 1	N. E. Ronan, Russell.	W. J. Menogue, Dawson.	L. A. Brown, Dawson.
Banner	C. Hardy, Bowesville.	E. Quail, N. Osgoode.	R. Raney, N. Osgoode.
Cold Springs	N. E. Ronan, Russell.	W. J. Menogue, Dawson.	J. H. Secord, Metcalf.
Eager's No. 1	Wm. Eager, Morrisburg.	Wm. Eager	H. Appleby, Heckston.
E. W. No. 7	Wm. Eager, Morrisburg.	D. McDermid, Vernon.	J. McDonald, Vernon.
E. W. No. 16	Wm. Eager, Morrisburg.	Wm. Eager	W. A. Gourdier, Kenmore.
Francis No. 1	G. W. Francis, Osgoode.	Robt. Carshane, Wilson Bay.	G. W. Francis.
Greeley	J. D. McPhail, Russell.	Wm. Grey, Greeley	Jno. Brisbois, Greeley.
Maple Grove	Jno. Sparks, Osgoode.	W. H. Hinnett	Jno. Sparks.
Metcalf	J. D. McPhail, Russell.	J. J. Sweeney, Metcalf.	P. Gillissie, Metcalf.
x M. P. F	J. McVey, Marvelville.	Dan. Hill	Robt. York.
North Branch	J. D. McPhail, Russell.	J. Kearns, Kenmore	G. E. Smith.
Osgoode, C	J. D. McPhail, Russell.	D. Fraser, Kenmore	Mr. Thair, Kenmore.
Osgoode, N	H. A. Morrison, North Osgoode.	A. Armstrong	H. A. Morrison.
Sunrise	Chas. Wing, Spring Hill.	Chas. Wing	Chas. Wing.
White Globe No. 2	Alpin Campbell, Ormond.	Jno. Campbell	Jno. Cresar, Vernon.
White Globe No. 4	Alpin Campbell, Ormond.	Jno. Campbell	T. K. Folkard.
White Globe No. 6	Alpin Campbell, Ormond.	Ira Bower, W. Osgoode.	L. A. Lindsay, West Osgoode.

Torbolton Township.

x Dirleton	J. F. Grierson, Dirleton.	Robt. Drummond	Ben. Anderson.
x Woodlawn	B. Barr, Woodlawn.	Isaac Davis	R. M. Somerville.

DUNDAS COUNTY.

Matilda Township.

Brinston	Payne & Ennis, Brinston.	Alex. Strader	Alvin Murdock.
Glen Stewart	Ed. Wynn, Glen Stewart.	Urias Holmes	Ed. Wynn.
Haddo	Geo. Merkley, Haddo.	Wm. Gibbons	Geo. Merkley.
Maple Grove	Payne & Smail, Brinston.	Alex. Strader	A. Smail.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

DUNDAS COUNTY.—*Continued.*

Matilda Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Matilda	W. J. Robinson. Iroquois.	Geo. Shaver	W. J. Robinson.
Matilda, C	Thos. McIntyre. Dixon's Corners.	Ancel Locke	Thos. McIntyre.
x Matilda, E	Lindsay Smith. Dundela.	Bruce McIntosh	Wesley Henderson.
x Matilda, S	Colin McGinnis. Iroquois.	Ed. Strader	A. W. Boulter.
Matilda, W	Smyth & Johnston. Iroquois.	T. W. Hare	W. Utman, Cardinal.
Model No. 1	E. A. Roode. Hulbert.	Ira Ellis	E. A. Roode.
Model No. 2	Wm. Reynolds. Hainsville.	Oliver Irving	Wm. Reynolds.
Model No. 3	Johnston & Young. Dundela.	John Marcellus	Albert Young.
x Morrisburg	Alex. Robinson. Morrisburg.	Alex. Robinson	Chas. Strader.
Minto No. 1	Wm. Holmes. Haddo.	Eli Merkley	Wm. Holmes.
McGregor	Wm. Lindsay. Brinston.	Geo. Gibson	Wm. Lindsay.
Pleasant Valley	Thos. Gilmour. S. Mountain.	D. Christie	Thos. Gilmour.
St. Lawrence	Jas. L. Cook. Iroquois.	T. W. Hare	Jas. L. Cook.
Strathcona	A. Barkley. Irena.	Wm. Gibbons	A. Barkley.

Mountain Township.

Advance No. 1	Ed. Scott, Heckston	Ed. Scott	Ed. Scott.
Belmeade	J. D. McPhail. Russell.	J. C. Campbell. McPhail.	G. B. Folkard, McPhail.
C. No. 102	R. T. Kerr. Mountain.	Wm. Loftus	R. T. Kerr.
F. F. No. 1	H. L. Miller. S. Mountain.	Mrs. A. Collison	H. L. Miller.
Farmers' Friend, No. 2	H. L. Miller. S. Mountain.	Ed. Rennie	H. L. Miller.
Gray's Model	Fred. Gray. Hallville.	Stephen Hoye	Fred. Gray.
Gordon Model	G. H. Taylor. Dalmeny.	J. F. Ferguson	G. H. Taylor.
Hallville No. 1	Jno. E. Dougall. Hallville.	Hugh Martin	Jno. E. Dougall.
Inkerman No. 1	Ennis & Rennie. Inkerman.	J. E. Crowler	H. H. Rennie.
Johnston No. 1	J. Johnston, Box 54. Winchester.	Albert Turner	J. Johnston.
King	W. D. Kennedy. Vernon.	Alex. Kennedy	A. Ducolon.
Mountain Ridge	Bishop Coons. Winchester.	Hugh McMaster	A. Taggert, Inkerman.
Oak Valley	John Henderson. Winchester Spgs.	J. Quinn, Inkerman	Ed. Lindsay.
Reid's Mills	Chas. Robertson. Reid's Mills.	Geo. Wiltson	Chas. Robertson.
South Mountain	Eager & Bishop. South Mountain.	D. J. Bishop	D. J. Bishop.
Suffel No. 855	John McTavish. Vancamp.	John McTavish	Fred Beckstead, Inkerman.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

DUNDAS COUNTY.—***Continued.***

Mountain Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Toy's Hill	John Henderson, Winchester Spgs.	Irwin Haggerty, Toy's Hill.	Sam Collison, Toy's Hill
Vancamp No. 853	John McTavish, Vancamp.	John McTavish	L. Munro.
White Globe No. 3	Alpin Campbell, Ormond.	John McCaul, Vernon.	G. J. Hampson, Vernon

Williamsburg Township.

	Archer	Wm. Myers, Nudell Bush.	Percy Prunner	Wm. Myers.
x	Bouck's Hill	Jacob Whittaker, Bouck's Hill.	N. Merkley	Robt. Beckstead.
	Bowman	Harry Philip, Glen Becker.	Wm. Bowman	Harry Philip.
	Carlyle	Carlyle Bros., Dunbar.	Adam Carlyle	Leslie Cass.
	Central	Harry Ogilvie, S. Mountain.	Thos. Beggs	Harry Ogilvie.
	Dunbar	Andrew Barkley, Dunbar.	Frank Whittaker	Simon Whittaker.
	Edwards No. 1	Wm. Edwards, Aultsville.	Harmen Fetterly, Hossie	Edwin Vincent, Hossie.
	Edwards No. 5	Wm. Edwards, Aultsville.	John Casselman	John McConnell.
	Elma	J. W. Dawson, Elma.	Frank Whittaker, Dunbar.	J. W. Dawson.
	E.W. No. 5	Wm. Eager, Morrisburg.	Wm. Eager	Thos. Patrick, Williamsburg.
	E.W. No. 6	Wm. Eager, Morrisburg.	Wm. Eager	Thos. Bowman.
	E.W. No. 15	Wm. Eager, Morrisburg.	Wm. Eager	Alex. Sharkey, Iroquois
	E.W. No. 26	Wm. Eager, Morrisburg.	Wm. Eager	B. Casselman.
	Froatburn	Thos. McDonald, Morrisburg.	Thos. McDonald	Carman Lakins, Froatburn.
x	Glenbecker	Jas. Berry, Glen Becker.	Stewart Barkley	Nathan Murphy.
	Hess No. 1	Alex. Hess, Williamsburg.	Geo. McIntosh	Alex. Hess.
	Mountain View	John Henderson, Winchester Spgs.	Anson Ellison	John Henderson.
x	Spruce Grove	John Wilson, Dunbar.	John Wilson	Levi Whittaker.
	Williamsburg	C. W. Norval, Williamsburg.	Isaac McIntosh	M. O. Dickey.

Winchester Township.

	Aults No. 1	J. W. Ault, Winchester.	R. H. Hogaboam, Cass Bridge.	C. J. Stewart, Cass Bridge.
	Aults No. 2	J. W. Ault, Winchester.	Jas. Moddie, Chesterfield.	J. W. Redmond, Chesterfield.
	Aults No. 3	J. W. Ault, Winchester.	Walter Moffatt	Herman Somers.
	Aults No. 4	J. W. Ault, Winchester.	Ezra Summers	Dan Burton.
	Aults No. 5	J. W. Ault, Winchester.	Preston Elliott, Chesterville.	Wm. Robinson, Chesterville.
x	Chesterville Co	M. E. Curran, Chesterville.	Wm. Gannon	Wm. Gannon.
	Chesterville	Sanderson & Nottell	J. Nottell	J. Nottell.
	C.W. No. 1	J. D. McPhail, Russell.	J. S. Kyle, N. Winchester.	D. A. Harris, Cannamore.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

DUNDAS COUNTY.—*Continued.*

Winchester Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
C.W. No. 3	J. D. McPhail, Russell.	Robert Fraser, Morewood.	Chas. Farmlo, Morewood.
Daisy	J. P. McIntosh, Winchester Spgs.	D. L. Collison	J. P. McIntosh.
Dundas Star	John Henderson, Winchester Spgs.	A. B. Allison	Fred Fetterly.
Ellis No. 1	L. A. Ellis, Winchester.	L. A. Ellis	Geo. Armstrong.
Levesque No. 2	G. N. Levesque, Marionville.	G. N. Levesque	G. N. Levesque.
Lorraine No. 1	Chas. Chambers, Chesterville.	Chas. Chambers	Chas. Weegar.
McLean No. 3	White & McLean, Chesterville.	Wesley Hamilton	V. D. Rady.
Morewood No. 1	A. J. Martin, Morewood.	A. J. Martin	W. Feiley.
Smith Hill	L. A. Ellis, Winchester.	L. A. Ellis	Clifford Stewart.
White Globe No. 1	Alpin Campbell, Ormond.	J. F. Campbell	Robt. McLaughlin.
White Globe No. 5	Alpin Campbell, Ormond.	John Campbell	Allan Utman, Winchester.
W.P.	H. Kendrick, Chesterville.	Wm. Allison, Dunbar.	Mr. Barkley.

DURHAM COUNTY.

Cavan Township.

Cavanville	Jos. Madill, Fraserville.	J. J. McGill, Cavan	Wm. Plumley, Cavan.
x Mt. Pleasant	Wm. Shields, Mt. Pleasant.	Geo. Jameson	Wm. McAdoo.

Darlington Township.

x Hampton	Chas. Stonehouse, Hampton.	W. R. Allen	Thos. Welsh.

Hope Township.

Hope	W. E. Fraser, Welcome.	B. F. Peters, Canton.	W. E. Fraser.
Perrytown	M. Wilson, Perrytown.	E. Corbett	H. Walters, Quays.

Manvers Township

Ballyduff	David Matthews, Ballyduff.	W. A. Jakeman, Pontypool.	David Matthews.
Fleetwood	Ryan & Renwick, Westwood.	Geo. H. Shea, Fleetwood.	J. C. Cummiskey, Fleetwood.

FRONTENAC COUNTY.

Bedford Township.

Bedford Mills	J. H. Singleton, Smith's Falls.	B. Tett, Bedford Mills.	C. W. Donaldson, Bedford Mills.
Desert Lake	W. H. Reynolds, Verona.	W. H. Reynolds	C. Vandiwater, Desert Lake.
Fermoy	Geo. Mustard, Elgin	Wm. Ripley, Westport.	Wm. Burke, Burridge.
Fish Creek	Geo. A. Smith, Parham.	G. A. Smith	C. Barr.
Glendower	W. H. Reynolds, Verona.	C. McKnight, Glendower	E. W. Redmond, Glendower.
Salem	D. P. Alguire, Westport.	Mrs. Mary Whalen	Wm. Taylor.
Tichborne	W. H. Reynolds, Verona.	John Kennedy, Tichborne.	Jos. Steele, Tichborne.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

FRONTENAC COUNTY.—*Continued.*

Barrie Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Cloyne	Head & Wise, Cloyne	Wm. Humphrie	Jos. Wise.

Clarendon Township.

Ardock	Publow & Munro, Ardock.	A. Munro	W. Waghorn.
Fernleigh	G. W. Killins, Fernleigh.	D. Lyons	D. Lyons.
Plevna	W. Martin, Plevna	G. Ostler	W. Martin.

Hinchinbrook Township.

Frontenac	Geo. A. Smith, Parham.	Geo. A. Smith	Geo. Terry, Wagarville.
Hinchinbrook	A. E. Hartin, Cole Lake.	Mrs. F. Leslie, Godfrey.	A. E. Hartin.
Oak Flats	W. H. Reynolds, Verona.	W. H. Reynolds	R. Vandiwater, Reynoldson.
Parham	Geo. A. Smith, Parham.	Geo. A. Smith	Fred Charlton.

Howe Island Township.

Howe Island	Geo. Wood, Howe Island.	P. Leavis	P. Marshall.
Thousand Island	Henderson & Wood, Howe Island.	Geo. Wood	Geo. Wood.

Kingston Township.

	Cataraqui	F. W. Valleau, Cataraqui.	Geo. Guess	F. W. Valleau.
x	Collins Bay	Arthur Day, Collins Bay.	A. Asslestine	E. Babcock.
	Corn Flower	Jos. McKendry, Glenburnie.	M. Sherriff	Mr. Bristlon.
	Elm Grove	Geo. Porter, Elginburg.	D. Corkell	Geo. Porter.
	Glenvale	Jos. Cramer, Glenvale.	J. Gordon	Jos. Cramer.
	Ideal	Herb. Sly, Elginburg.	Mabel Jackson	Herb. Sly.
	Westbrook	W. H. Daugherty, Odessa.	J. C. Fraser	Reuben Smith, Westbrook.

Kennebec Township.

Arden	John Black, Arden	John Black	John Black.
Arrigan	Jas. Hogan, Maple Lawn.	Wm. Keenan	Jos. Robinson.
Harlowe	Wm. Pipe, Harlowe	Mrs. C. Hillier	Geo. Somerville.
Maple Grove	Robt. P. Hawley, Dead Creek.	Robt. P. Hawley	Robt. P. Hawley.
Mount Hope	Gilbert Thompson, Elm Tree.	J. W. Thompson	Ross Thompson.
Mountain Vale	John Dean, Arden	John Dean	John Dean.

Loughborough Township.

	Forest	Chas. Gonu, Sydenham.	H. Moreland	Chas. Gonu.
	North Shore	J. D. Keeley, Railton.	W. H. Kennedy, Leland.	Ed. Johnstone, Leland.
x	Perth Road	Wm. Ritchie, Perth Road.	Wm. Ritchie	Wm. Stone.
	Railton	Carey & McAuly, Railton.	C. Rutelige, Sydenham	Mrs. A. Bowen, Sydenham.
	Sydenham	R. B. Cochrane, Sydenham.	Thos. Maxwell	R. B. Cochrane.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued*

FRONTENAC COUNTY.—*Continued.*

Miller Township.

	Name of Factory.	Proprietor or President.	Secretary.	Maker.
x	Wensley	F. Wensley, Wensley	F. Wensley	C. McNeil.

Olden Township.

Elmdale	D. J. Cronk	D. J. Cronk	Ed. Godfrey.
	Mt. Grove.		
Long Lake	Ira Smith	Mrs. F. Leslie, Godfrey	Fred Gibbs.
	Long Lake.		
Mountain Grove	D. J. Cronk	D. J. Cronk	Joshua Cox.
	Mt. Grove.		
St. George's Lake	John Hetherington	John Hetherington	S. L. Brintnell.
	Sharbot Lake.		

Oso Township.

x	Crow Lake	Geo. Bradshaw	W. Hetherington	Wm. Barker.
		Crow Lake.	Sharbot Lake.	
	Oso	G. Valleau, Oso	G. Valleau	G. Valleau.

Pittsburg Township.

Anglin	F. Anglin	Mrs. S. McCallum	Jno. Humphrie.
	Brewers Mills.		
Central	Anglin & Atkinson	P. Shortell, Gananoque	Blake Howe.
	Atkinson.		
Granite Hill	Chris. Grenizen	D. McClement,	Chris. Grenizen.
	Pittsferry.	Gananoque	
Jackson	E. Jackson	T. J. Ellis	E. Jackson.
	Gananoque.		
Keenan & Sons	Jno. Keenan	Jno. Keenan	G. Rancier.
	Kingston Mills.		
Maple Leaf	Agnew Bros.	Mrs. M. M. Wilson	A. A. Miller.
	Joyceville.		
Morning Star	Dan McLean, Eric	J. V. Stewart	Dan McLean.
Pine Hill	Martin & Franklin	W Franklin	Geo. Robinson.
	Cushendall.		
Pine Grove	Maitland & Dillon	Miss Page, Atkinson	G. C. Valleau.
	Brewers Mills.		
Rose Hill	Jno. Burnash	J. B. Quinn	Jno. Burnash.
	Dufferin.		
Woodburn	Chas. Shook	Mrs. F. Wilson	Chas. Shook.
	Willetshome.		

Palmerston Township.

x	Parkhill	Jas. Geddes	Jas. Geddes	P. Griffin.
		McLaren's Depot.		

Portland Township.

Bell Rock	Vanluven Bros	E. Vanluven	F. Snider,
	Moscow.		Bell Rock.
Harrowsmith	A. E. Bradshaw	Jas. McKim	Will Lyons.
	Harrowsmith.		
Hartington	Earl Ryan	H. Jamieson	Earl Ryan.
	Hartington.		
Verona	W. H. Reynolds	W. H. Reynolds	Jas. H. Hicks.
	Verona.		

Storrington Township.

x	Battersea	Isaac Holder	Wm. Anglin	H. J. Walker.
		Battersea.		
	Coldspring	C. W. Langwith	C. W. Langwith	Robt. Gibson.
		Sunbury.		

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

FRONTENAC COUNTY.—*Continued.*

Storrington Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Excelsior	R. J. Stanley, Keelerville.	Jno. Robb	R. J. Stanley.
Inverary	Wm. Johnston, Inverary.	Mrs. A. Ferguson	R. Hollingsworth.
Latimer	Jno. Taylor, Latimer.	Miss M. Lyon	Ernest Prevost.
Lake Opinicon	Geo. Kerr, Elgin	Jno. Darling, Lake Opinicon.	Frank Best, Lake Opinicon.
McGraths	Jos. McGrath, Mt. Chesney.	Jos. McGrath,	Francis Orr, Sunbury.
Model	Thompson & Ferguson, Inverary.	H. Hughson, Kingston.	Thos. McKnight.
x Sunbury	Wm. McNeeley, Sunbury.	Nelson Jackson.	Bert. Smith.
x Sandhill	Wm. Patterson, Sunbury.	W. E. Henley, Battersea.	Harry Rettan.

Wolf Island Township.

Gilt Edge	Arthur Henderson, Allen.	Jno. Irwin	Arthur Henderson.
Ontario	David Southal, Wolf Island.	J. W. Spoor	David Southal.
St. Lawrence	Geo. Rattray, Wolf Island.	Geo. Rattray	Bert. Kent.
x Silver Spring	Thos. Fawcett, Wolf Island.	Geo. Keys	Wm. Fitzgerald.
x Wolf Island	D. H. Hinkley, Wolf Island.	Mrs. J. M. Horne	J. H. Fawcett.

GLENGARRY COUNTY.

Charlottenburg Township.

x Avondale	B. G. Munroe, Munroe's Mills.	B. G. Munroe	D. Levac.
Burn Brae	Jas. R. May, Martintown.	J. M. Grout	Jas. R. May.
Farmers' Pride	F. N. Duvall, Summertown Sta.	Mrs. Barrett	F. N. Duvall.
Glen	W. J. Quinn, St. Andrews.	A. J. McIntosh, Martintown.	Chas. Hutt, Martintown
Glendale	Geo. F. Brown, Williamstown.	Mrs. A. D. McCrea	Alex. Clark.
Glen Donald	Fred Pickard, Glen Donald.	Mrs. Alex. Grout, Glen Brook.	Fred Pickard.
Glengarry Creams	A. R. McDonald, Glen Brook.	Wm. Kennedy	Ernest Haslem.
Glen Gordon	W. G. Graham, Vankleek Hill.	A. B. McLennan, Lancaster.	J. A. Flood, Lancaster.
Glen Roy	Rod. McDonald, St. Raphaels.	D. J. McDonald	Geo. McMillan, Glen Roy.
Green Valley	A. D. McPherson, Green Valley.	A. D. McPherson	A. D. McPherson.
Glen Walter	W. J. Haldsworth, Glen Walter.	Mrs. Adams, Cornwall.	W. J. O'Brien.
x Kings' Road	Alex. A. McDermid, Martintown.	Miss M. McGregor	Louis Pilon.
Lilly White	Wm. Irvine, Martintown.	Colin Campbell,	Andrew Lafoe.
x North Branch	A. J. Robertson, Martintown.	A. J. Robertson	E. Fortin.
River Bank	E. E. Chaffee, Summerstown.	Miss Graham, Cornwall.	E. E. Chaffee.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

GLENGARRY COUNTY.—*Continued.*

Charlottenburg Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Royal	Harry McLaren, Summerstown.	Mrs. Barrett	Harry McLaren.
St. Raphaels	Rod. McDonald, St. Raphaels.	D. J. McDonald	Rod. McDonald.
Silver Lilly	A. A. McDonald, Summerstown Sta.	Miss M. M. Grout	A. B. McDonald.
Silver Lilly No. 2	A. A. McDonald, Summerstown Sta.	Miss M. M. Grout	Albert Cartier.
Star No. 1	D. R. McDonald, Alexandria.	C. A. Catanach, Williamstown.	C. A. Catanach.

Kenyon Township.

Apple Hill No. 1	Wm. Hase, Apple Hill.	Wm. Hase	Wm. Hase.
x Apple Hill Ass'n	A. Driver, Apple Hill.	A. Driver	Hugh Legault.
x Baltic Cors	J. McPhee, Greenfield.	Wm. McDonald	David Hough.
Battle Hill	Alex. Fraser, Laggan.	E. A. McMillan	A. J. McDonald.
x Brookdale	W. Kennedy, Apple Hill.	W. Kennedy	Wm. Seguin, Dominionville.
x Dominionville	J. P. McNaughton, Dominionville.	J. D. McIntosh	Donald McIntosh.
x Dornie	A. McPhee, Alexandria.	A. McPhee	Telephore Periard.
x Echo	H. Legault, Maxville.	Miss M. J. Grant	Moses Bovneau.
x Fairview	D. McDonald, Fassifern.	A. A. McDonald, Greenfield.	A. N. McDonald, Alexandria.
x Greenfield Union	J. R. Kippen, Greenfield.	D. D. Kippen	Jas. Adams.
Heather Bloom	J. A. McKinnon, Alexandria.	J. A. McKinnon	J. A. McKinnon.
x Highland Chief	R. Cuthbert, Alexandria.	H. W. McNaughton	W. McNaughton.
McLean's No. 1	Geo. McLean, Finch.	Geo. McLean	Wm. Blair.
Minto No. 2	Neil Fraser, Vankleek Hill.	Neil Fraser	Geo. Bentley, Dunvagen
Sunrise No. 1	N. McCrea, Athol	N. McCrea	N. McCrea.
Sunrise No. 2	N. McCrea, Athol	N. McCrea	Frank Gireau, Dunvagen.
Sunrise No. 3	N. McCrea, Athol	N. McCrea	Andrew Sorrell, St. Elmo
Western Star	G. Prieur, Green Valley.	J. Prieur	J. Pajer, Glen Roy.

Lancaster Township.

Aberdeen	Jos. Strasabourg, Glen Robertson.	V. Roy	Jos. Strasabourg.
Banner No. 1	Jas. Munro, Lancaster.	J. A. McLennan	Jas. Munro.
Banner No. 2	F. Cattanach, N. Lancaster.	T. W. Munro, Dalhousie Sta.	N. A. Morrison.
Bainsville	Sangster & McCaug, Bainsville.	D. D. McCaug	Jno. Uren.
x Bridge End	D. A McKinnon, Bridge End.	A. J. McDonald, N. Lancaster.	K. Morrison.
Curry Hill	Sangster & McCaug, Bainsville.	D. D. McCaug	H. E. Bealer, Curry Hill.
Dalhousie Mills	N. Brabant, Dalhousie Mills.	P. Major	N. Brabant.
Glen Dale No. 2	J. Gordon, Lancaster.	J. Gordon	J. Gordon.
Glen Evis	A. Vaillancourt, Glenevis.	T. Munro, Dalhousie Sta.	A. Vaillancourt.
x Glen Norman	D. D. McCrea, Glen Norman.	Jno. Gillis	J. A. McDonald.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

GLENGARRY COUNTY.—*Continued.*

Lancaster Township.—*Continued.*

	Name of Factory.	Proprietor or President.	Secretary.	Maker.
	McLaughlins	Jos. Prieur, Green Valley.	Jos. Prieur,	Jos. Prieur.
	Pine Grove.	J. Cameron N. Lancaster.	T. Munro Dalhousie Sta.	J. Cameron.
x	Pine Hill	M. Munro N. Lancaster.	A. J. McDonald	R. McDonald.
x	Picnic Grove.	W. J. McNaughton Lancaster.	W. J. McNaughton	B. McPherson.
	Victoria	Alex. Sauvie Bainsville.	W. Condie	Alex. Sauvie.

Lochiel Township.

	A. No. 318.	Telesphore Villemarie. Glen Sandfield.	T. Vachon St. Anne de Prescott.	Telesphore Villemarie.
x	Balmoral	A. McMillan Glen Robertson.	D. J. McDonald	Eric Levac.
	Burtalbin	K. D. McLeod Dalkeith.	K. D. McLeod	W. J. O'Neil, Vankleek Hill.
	Central	A. D. McDonald Alexandria.	W. J. Dawson	Lyman Graham.
	Cedar Grove	D. W. Fraser Dalkeith.	D. W. Fraser	Rod. Fraser.
	Glengarry	David Lacomb Alexandria.	S. O'Connor Glen Robertson.	David Lacomb.
x	General Roberts	Nap. Legault Macormick.	Mrs. M. McDonald	A. Cedelotte.
	Glen Robertson	J. Brabant Glen Robertson.	J. Brabant	J. Brabant.
	Glensandfield	K. D. McLeod Dalkeith.	K. D. McLeod	F. Lacomb, Glensandfields.
	Kirk Hill No. 3	K. D. McLeod Dalkeith.	K. D. McLeod	R. Trottier, Kirk Hill.
	Kirk Hill No. 7	K. D. McLeod. Dalkeith.	K. D. McLeod	J. Cousineau, Lochiel.
	H. L. No. 155	H. Lacomb Glen Robertson.	Gilbert Seguine..	H. Lacomb.
	Laggan No. 1	K. D. McLeod Dalkeith.	K. D. McLeod	Jno. Wright, Laggan.
x	Lorne	Norman McGilvray Lochiel.	V. G. Chisholm	S. Seguine.
x	Lochinvar	W. E. McKillican Vankleek Hill.	W. E. McKillican	Chas. F. Parker.
	Macks Cors	K. D. McLeod Dalkeith.	K. D. McLeod	Ben Goodman.
	Minto No. 1	Neil Fraser Vankleek Hill.	Neil Fraser	Walter Fenlong, McCrimmon.
	Queen No. 1.	E. Tittley, Dalkeith	J. C. McLaren	E. Tittley.
x	Union	A. B. McDonald Alexandria.	G. McKinnon	Robt. Maxwell.
	White Clover	W. Hays Dalkeith.	J. Denevan. Vankleek Hill.	W. Hays.

GRENVILLE COUNTY.

Augusta Township.

	Algonquin	R. Earl Algonquin.	F. K. Wright	R. Earl.
x	Cedar Grove	J. Fell, Prescott	J. Palite	F. Leslie.
	Charleyville	L. Jackson Charleyville.	Miss E. Stevenson	L. Jackson.
	Domville	J. A. Bradley Prescott.	D. Ewart, Domville	G. Brown.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

GRENVILLE COUNTY.—*Continued.*

Augusta Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Garretton	Meech & Glassford, S. Branch.	J. McElree, Garretton	F. Meech.
Glenmore	P. Pyke, Glenmore	F. Tanny	P. Pike.
Grenville	J. Fretwell, Blue Church Rd.	Mrs. E. Fox, Maitland.	J. Fretwell.
Ireland	S. Kirkley, Algonquin.	Mrs. E. White	S. Kirkley.
Lee Hill	J. Fretwell, Blue Church Rd.	Mrs. E. Fox, Maitland.	D. Warren, Maitland.
Maitland Union	J. Fretwell, Blue Church Rd.	Mrs. E. Fox, Maitland.	J. Richardson, Maitland.
North Augusta	R. Earl, Algonquin.	W. B. Moffatt, N. Augusta.	S. Langley, N. Augusta.
Rideau Valley	Everett & Ragsdale, Smith's Falls.	J. Kerr,	D. Kelly, Merrickville.
River View	J. W. McLean, Maitland.	Mrs. T. McLean	R. Richards.
Roebuck	W. McLean, Roebuck	R. W. Kingston	W. Place.
South Branch	Thos. Meach, S. Branch.	J. Ludlow, S. Augusta.	Thos. Meach.
Willow	H. Bissell, Brockville.	J. Beatty, S. Augusta.	W. R. Swain, S. Augusta.

Edwardsburg Township.

Canada Pride	J. W. Alkerton, Spencerville.	A. Startin	J. W. Alkerton.
Crystal Rock	A. C. Gore, Crystal Rock.	W. Gore	J. W. Lawson.
Glen Mail	Wm. Eager, Morrisburg.	R. Bennett, Glen Mail.	R. W. Riddell, Glen Mail.
Graveton	J. J. Payne, Brinstons.	S. Jennings, Graveton.	R. McFadden, Graveton.
Hill Brook	J. W. Small, Prescott.	J. W. Small	J. W. Small.
Hyndman	J. Hyndman, Hyndman.	Miss E. Jackson	J. Hyndman.
Johnstown	Scott & Curry, Johnstown.	T. Curry	W. Morgan.
Langstaff No. 1	S. Langstaff, Spencerville.	W. Snider	S. Langstaff.
x Mainsville	W. H. Adams, Mainsville.	S. Mallatt	W. Perry.
Miller's No. 1	T. J. Miller, Spencerville.	Miss G. Fairbairn	E. Hunter.
Miller's No. 2	T. J. Miller, Spencerville.	C. Fairbain, Ventnor.	C. Moore, Ventnor.
Park Avenue	Scott & Curry, Johnstown.	W. Hunter, Cardinal.	F. Johnston, Cardinal.
Pittston	W. R. Hunter, Pittston.	H. Miller	W. R. Hunter.
x Shanley	R. Wallace, Shanley	W. Holmes	Alva Froom.

Gower, South, Township.

Kemptville No. 2	Fred. Robertson, Kemptville.	J. H. Robertson, North Rideau.	Fred. Robertson.
South Gower	T. O. McFadden, South Gower.	C. B. Clark	T. O. McFadden.

Oxford Township.

Bishop's Mills	Ed. Alexander, Bishop's Mills.	Frank Dool	Fred. Dool.
Burritt's Rapids	Robt. Ferguson, Burritt's Rapids.	W. J. McLaughlin	Robt. Ferguson.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

GRENVILLE COUNTY.—*Continued*

Oxford Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
x Farmers' Union	Adam Ennis, Farmers' Union.	Jno. Ludlow, Centre Augusta.	Freeman Brown.
Miller's Corners	E. H. Graham, Miller's Corners.	Philip Findlay	D. Forbes.
Oxford Mills	W. J. Fretwell, Oxford Mills.	W. J. Rutherford, Kemptville.	W. J. Fretwell.
Oxford Station	J. Sanderson, Oxford Station.	E. N. Bowie	Wm. Grue.
Patterson's Corners	Anderson & Beckett, Oxford Station.	Jas. Templeton, Patterson's Corners.	T. J. Coffee, Patterson's Corners.
x Scotts	Geo. Ward, Acton's Corners.	Wm. Scott	H. M. Wedmark.
Island Queen	Chas. Maitland, Jasper.	Mrs. M. Maitland	J. A. Swayne.
Mount Zion	R. Earl, Algonquin	F. Tenny, Glen Moor	A. Hough, Bishop's Mills.
Old Fairfield	Everett & McDonald, Easton's Corners.	Mrs. R. Bissell	G. H. Barker.
Union	E. M. Davis, Wolford C.	J. McIntyre, Easton's Corners.	E. M. Davis.

HALIBURTON COUNTY.

Cardiff Township.

x Deer Lake	A. G. Tate, Highland Grove.	A. G. Tate	T. J. Lowery.

HASTINGS COUNTY.

Carlow Township.

x Fraser Creek	Henry Harryett, Fort Stewart.	J. E. Greaves	Jas. Mather.

Cashel Township.

x Cashel	J. H. Gunter, Gunter.	T. A. Hinchcliffe	S. McTaggart.

Dungannon Township.

x Bronson	Robt. Lancaster, Bronson.	Wm. Detlor	Harry Juby.
x Kelly Creek	Wm. Cornell, Detlor.	P. A. Bradshaw	J. D. Hennessy
x Walkerville	Jas. Liddle. L'Amable.	Jas. McGibbon	Jno. Finnegan.

Elzevir Township.

x Marble Spring	Wm. Greatrix, Actinolite.	Bert. Bouck	Bert. Bouck.

Faraday Township.

x Faraday	Norman Gilroy, Faraday.	Norman Gilroy	Nelson Vancliffe.

Herschel Township.

x Beechmount	Chas. Plumley, Beechmount.	Chas. Plumley	Wm. Smith.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.--*Continued.*

HASTINGS COUNTY.—*Continued.*

Hungerford Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
x Bogart	Geo. Knowles, Stoco.	Geo. Knowles	L. Rutter.
x Clair River	Patrick Kinlin, Bogart.	Patrick Kinlin	Jos. McEvoy.
x Maple Ridge	Jas. Taylor, Marlbank.	Miss McCutchen	N. Frizzell.
x Marlbank	Nelson Booth, Marlbank.	Jas. McKetrick, Selby.	Walter Sills.
x Moira Valley	T. H. Monck, Thomasburg.	Thos. H. Monck	Jno. Morton.
x Moneymore	Jno. Coulter, Moneymore.	G. H. Henderson, Lime Lake.	L. W. Mason.
x Murphy	Jos. Tracey, Larkins.	Jos. Tracey	T. J. Murphy.
x Otter Creek	Jno. Labarge, Park House.	Jno. Labarge	A. Brownson, Otter C'k.
x Premier	Howard Porter, Thomasburg.	Howard Porter	W. G. Marlin.
x Roblin	J. L. Newton, Chapman.	J. L. Newton	D. L. Shorey.
x Rock	Michael Reshotte. Tweed.	Michael Reshotte	Jas. Montgomery.
x Stoco	Michael McAvoy	Michael McAvoy	Patrick Hart.
x Thomasburg	M. Coulter Stoco.	M. Coulter	Miles Lattie.
x Tweed	Thos. Graham, Tweed.	Thos. Graham	J. Parrott.
x Victoria	Jos. Bateman, Tweed.	Jos. Bateman	W. A. Master.
x Buelah	Jno. Fleming, Ivanhoe.	Jno. Fleming	Clayton Chambers.
x Daisy	Larry Foley, Madoc.	Larry Foley	Frank Bouck.
x Glen	Jno. Fleming, Ivanhoe.	Jno. Fleming	J. W. Young.
x Moira	J. B. Morton, Moira	J. B. Morton	Anthony Herity.
x West Huntingdon	Jas. Hawkins West Huntingdon.	Jas. Hawkins	C. L. Brownson.
x White Lake	Jno. Kilpatrick Crookston.	Jno. Kilpatrick	Thos. W. Sullivan.

Lake Township.

x Vansickle	Geo. Vansickle. Vansickle.	Wm. Carman	Fred. Vansickle.

Limerick Township.

x Limerick	Mark Mawson, Steinburg.	P. P. Clark, St. Ola	F. Remington, St. Ola.

McClure Township.

x McClure	Jas. Maddock Maynooth.	Miss M. Carswell	Morley Gould.

Madoc Township.

x Alexandria	Jas. A. Caskey, Madoc.	Jas. A. Caskey	S. H. Twiddy.
x Brook Valley	T. E. Burnside Eldorado.	T. E. Burnside	Gerald Brown, Madoc.
x Champion	J. D. Nickle, Malone.	J. D. Nickle	J. H. Rowe, Empey.
x Cold Springs	Jerry West, Madoc.	Jerry West	Wm. Rowe.
x Eldorado	C. J. Wright Eldorado.	C. J. Wright	Albert Beckwith.
x Madoc	Chas. Thompson Queensboro.	Chas. Thompson	Adam Roushorn.
x Oak Leaf	Hugh M. Blair, Cooper.	Hugh M. Blair	E. E. Diamond.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

HASTINGS COUNTY.—*Continued.*

Madoc Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
x Queensboro	T. H. Moore, Queensboro.	T. H. Moore	W. H. Bailey.
x Rose	Angus Nicolson, Madoc.	Angus Nicolson	Z. Bristol, Eldorado.
x Spring Creek	Geo. Bacon	Geo. Bacon	A. E. Smith.
x Spring Hill	Jno. Lewis, Madoc	Jno. Miller	R. O. Miller.

Marmora Township.

x Cooks	Hugh Maloney, Marmora.	Hugh Maloney	Geo. Forestell, Cardova.
x Marmora	Wm. Hilton, Marmora.	Wm. Hilton	Wm. Linn.
x Riverside	H. Shannon, Marmora.	Jno. Boothe	Jesse Williams.
x Silver Leaf	Ralph Laycock, Deloro.	Ralph Laycock	Walter Lidster.

Mayo Township.

x Mayo and Raglan	Henry Harryett, Fort Stewart.	Robt. Ramsbottom, Rowland.	G. A. Ferguson, Maynooth.

Monteagle Township.

x Greenview	W. J. Douglas, Greenview.	W. J. Douglas	H. S. Nix, McArthur's Mills.
x Hybla	Thos. Bartlett, Hybla.	Thos. Bartlett	E. J. Neal.

Rawdon Township.

x Bell	Andrew Reid, Springbrook.	Andrew Reid	W. J. Moore.
x Central	Geo. A. Johnston, Stirling.	Geo. A. Johnston	Walter Barker, Anson.
x Enterprise	W. T. Sine, Sine	W. T. Sine	R. G. Thrasher.
x Evergreen	Robt. Lannigan. Stirling.	Wm. Keegan	Geo. Rose.
x Harold	Jno. Tanner, Harold	J. R. Cooke	Jno. West.
x Kingston	Paul Kingston, W. Huntingdon.	Paul Kingston	Wm. Wright, Ivanhoe.
x Maple Leaf	Geo. Burkett, Bellview	Geo. Burkett	Jno. Lane.
Monark	W. J. Irwin, Sarginson.	Robt. Cook, Harold	W. J. Irwin.
x Plum Grove	Fred. Fanning, Wellman's Corners.	Wm. Pollock	Geo. Whitton.
Spry	Jas. Spry, Stirling	Jas. Spry	F. G. Kendall, Bellview.
x Springbrook	T. J. Thompson, Springbrook.	T. J. Thompson	R. W. Thompson.
x Stirling	C. W. Thompson, Stirling.	C. W. Thompson	Geo. Chambers, Sine.

Sidney Township.

x Acme	A. S. White, Sidney Crossing.	Edgar Harvey, Glen Millar.	Jno. Lloyd, Glen Miller
x Bayside	Chas. Myers, Bayside.	Chas. Myers	Wm. Haddrell.
x Eclipse	Jas. Sparks, Chatterton.	Walter Boardman	Thos. Lloyd, Hollaway
x Frankford	Chas. Gallinger, Frankford.	Joshua Anderson	W. W. Carter.
x Shamrock	Jno. Seager, Stirling.	Jno. Seager	C. F. Linn.
x Sidney Town Hall	Thos. Ketcheson, Belleville.	Thos. Ketcheson	Norman Purdy, Wallbridge.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

HASTINGS COUNTY.—*Continued.*

Thurlow Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
x East Hastings	Wm. Collins. Poucher's Mills.	Wm. Collins	J. E. Howard.
x Hollaway	Jas. McMullen. Hollaway.	Jas. Denyes	Adam Lloyd.
x Plainfield	Alex. Moore. Plainfield.	Alex. Moore	Bruce Way, Poucher's Mills.
x Roslin	Nelson Sills, Roslin	Nelson Sills	A. Lloyd.
x Sidney	Manley Farley. Belleville.	Jno. Drewery	Thos. H. Irvine.
x Silver Spring	T. C. Treverton. Poucher's Mills.	T. C. Treverton	M. C. Haight.
x Thurlow	Geo. Johnston. Belleville.	Henry Norman	Geo. L. Ward.
x Thurlow	Jno. Holgate. Foxboro.	Wm. Clark.	Gilbert Hough.
x Union	W. C. Farley. Canifton.	W. C. Farley	Wm. Lattie.
x Zion	J. F. Ketcheson. Philipston,	J. F. Ketcheson	M. B. Spencer, Foxboro.

Tyendinaga Township.

x Albert	Jas. Welsh, Albert.	Jas. Welsh	Bert Wheeler.
Deseronto	Brennan & Bury. Deseronto.	Manly Jones	Chas. Brennan.
x Melrose	A. G. Lazier, Melrose.	A. J. McLaren	Jos. Henderson.
x Mountain	Archie McDonald. Shannonville.	Isaac Sills	Henry Greatrix.
x Rosebud	Garrett Foley. Myra Hall.	W. A. Chapman. Roslin.	Jno. Farrington, Read.
x Shannonville	Stewart Dise, Shannonville.	Jas. Hill	J. J. Brennan.

Wollaston Township.

x Coe Hill	J. D. Vincent. Coe Hill.	J. D. Vincent	Hugh Lackie.
x Crosby	Anson Reid, Ormsby.	Anson Reid	W. J. Potter.
x The Ridge	Robt. Henderson. The Ridge.	Dan. Henderson	L. Ward.

LANARK COUNTY.

Bathurst Township.

x Bathurst Mutual	Geo. Corry, Elliot	W. J. Cameron. Wemyss.	H. Coleman.
Brooke	J. H. Singleton. Smiths Falls.	Jas. McGregor. Brooke.	H. Kirkham, Brooke.
Christie's Lake	H. Pownell, Elliott	W. A. Moore, Perth	H. Pownell.
x Fallbrook	Geo. Kerr, Fallbrook.	Geo. Kerr	D. Innis.
x Harper	P. Cavers, Harper	P. Cavers	Alf. Buffam.
x Scotch Line	Jno. Ferrier, Perth	Jno. Ferrier	B. Avery, Scotch Line.
x Tayside	J. Cuthbertson, Perth.	Jas. Leaver	Jas. Cowie, Balderson.

Beckwith Township.

Black's Corners	R. E. McLenaghan. Carleton Place.	W. A. Moore, Perth	S. Stewart. Carleton Place.
Prospect	J. H. Singleton. Smiths Falls.	Miss M. Kidd, Prospect	J. H. Perault, Prospect.
Tennyson	H. Devlin, Tennyson.	Neil Stewart. Carleton Place.	W. Byron.
x Valley Queen	J. Pierce, Franktown	W. McDonald	W. Kilfoyle.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

LANARK COUNTY.—*Continued.*

Burgess N. Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Black Creek	P. J. McPartland, Westport.	S. T. Dowson, Perth	T. W. Everett, Darcyville.
Stanleyville	J. H. Singleton, Smiths Falls.	E. Burns, Micaville	D. Cornell, Micaville.

Dalhousie Township.

x Dalhousie	U. Dunlop, McDonald's Corners.	W. McCulloch	R. Harper.
x Elphin	Jas. Smith, Elphin	H. Budd	S. Gordon.

Drummond Township.

x Balderson	J. A. D. McLean, Balderson.	J. A. D. McLean	J. M. Scott.
x Drummond	D. Welch, Drummond.	D. Welch	J. Miller.
x D. and E.	E. Burke, Perth	Jno. Kerr	W. W. Echlin, Richardson.
x L. and D	M. M. Knowles, Lanark.	M. M. Knowles	M. Haley.
x Mississippi	T. Stafford, Lanark	T. Stafford	A. Quinn, Prestonvale.

Elmsley N. Township.

Elm Grove	J. H. Singleton, Smith's Falls.	A. Muncie, Rideau Ferry.	H. Jones, McCue.
Lone Star	P. McEwen, Franktown.	J. Leach, Port Elmsley.	R. Morris, Port Elmsley.
Mayberry	A. Cameron, Smiths Falls.	C. McNab, Glen View.	S. H. Sparks, Glen View.
x Old Ferry Road	A. Poole, Perth	W. Spaulding, Perth.	Geo. Lewis.

Lanark Township.

Brightside	Scott & White, Balderson.	J. M. Scott.	H. Jenkins.
x Boyds	W. Willows, Carleton Place.	A. Hammond	L. Prentice, Ennisville.
Clyde	Herron & Baird, Herrons.	Mrs. J. Herron	A. E. Keays, Lanark.
x Darling and Lanark	J. M. Scott, Balderson.	J. M. Scott	A. McDougal, Hall's Mills.
x Hopetown	T. Pretty, Hopetown.	D. Forbes, Watson's Corners.	Jas. Chalmers.
x Middleville	A. R. McIntyre, Middleville.	A. R. McIntyre	O. Stewart.
x Watson's Corners	D. Forbes, Watson's Corners.	D. Forbes	Ed. Rennett.

Lavant Township.

Joe's Lake	Scott & White, Balderson.	J. M. Scott	T. Baggs, Carleton Pl.
x Poland	W. Stewart, Poland.	G. White	Stewart Forbes.

Montague Township.

x Farmer's Own	J. H. James, Merrickville.	Dan. Moore	A. McConnell.
Montague C,	Hugh Clark, Smiths Falls.	J. Cram	Harry Clark.
Roseville	Strong & Clark, Smiths Falls.	Hugh Clark	Hugh Clark.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

LANARK COUNTY.—*Continued.*

Pakenham Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
xPakenham	P. Noonan, Pakenham	J. McCreary	J. Jackson.

Ramsay Township.

Appleton	Everetts & Wylie Almonte.	J. Wilson Smiths Falls.	D. Kennedy, Appleton.
Carleton Place	W. H. Gardiner Carleton Place.	W. H. Gardiner	W. H. Gardiner.
x Clayton	Jas. Rath, Clayton	Jas. Rath	A. Miller.
x I. X. L.	H. McCreary McCreary.	H. McCreary	T. K. White.
Mississippi Pride	Everett & Wylie Almonte.	J. Smith	H. McIntosh.
Rosebank	Everett & Wylie Almonte.	R. Young, Blakney	H. Coxford, Blakney.
Rosedale	Everett & Wylie Almonte.	Jas. Savage, Clayton	J. Hichcock, Clayton.

Sherbrooke, N. and S., Township.

x Fall River	Arch. Gray, Maberly	Mrs. Jno. Palmer.	
x Lake View	Thos. Dowdall Althorpe.	Lizzie Norris	Stephen Martin.
Maberly	W. Walroth, Maberly	M. Manders	W. Walroth.
Zealand	Jno. Heatherington Sharbot Lake.	Jno. Heatherington	J. F. Gordon.

LEEDS COUNTY.

Bastard Township.

Farmers' Pride	Halladay & Stevens Philipsville.	Chas. Tackeberry	Roy Halliday.
Forfar	D. DeWolf, Westport	Ceaser Myres, Forfar	Wm. Welch, Forfar.
Grand Central	Frank Seed, Chantry	Isaac Stevens	Frank Seed.
Island City, No. 1	Kilburn & Davidson Delta.	C. Copeland	M. Kilburn.
Myers, No. 1	Derbyshire & Myers Portland.	H. Graham	W. C. Gunness.
Portland	Polk & Leggett Portland.	M. J. DeWolf	Isaac Freeman.
Plum Hollow	G. W. Dunham Plum Hollow.	Miss E. Bullard	Chas. Burt.
Reliable	A. E. Irwin. Newboyne.	Miss F. Lyons	A. E. Irwin.
Smiths Valley	Geo. Owens, Harlem	H. Ayer	George Owens.

Burgess, S., Township.

Clear Spring	J. H. Singleton Smiths Falls.	Chas. Jones, Cranworth	W. Ireland, Cranworth

Crosby, N., Township.

Ardmore	Thos. Samuels. Westport.	Mrs. Mary Whalen	Thos. Samuels.
Cedar Bridge	P. J. McPartland Westport.	Mrs. Mary Whalen	P. Whalen, Cedar Bridge
Centreville	Sam. McCann Westport.	Mrs. Mary Whalen	Sam. McCann.
Mapleton	P. J. McPartland Westport.	Mrs. Mary Whalen	Wm. Milligan.
Mountain View	Dyre & McCann Westport.	W. Ripley	Percy Rise.
Newboro Model	J. H Singleton Smiths Falls.	J. Lynett, Westport	Norman Truelove, Newboro.
Westport	J. H. Singleton Smiths Falls.	J. Foley, Westport	D. McClement, Westport.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

LEEDS COUNTY.—*Continued.*

Crosby, South, Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Briar Hill	Jas. Somerville, Morton.	A. Dillon	Jas. Tuttle.
Bush Model	Thos. Wright, Elgin	A. Dillon, Morton	W. H. Hope, Morton.
Clear Lake Union	Geo. Kerr, Elgin	Mrs. Ed. Wright, Crosby.	Geo. Kerr.
Clear Lake View	Ed. Rousewell, Crosby.	Mrs. Rose Leggett, Newboro.	W. C. Rouswell.
Crosby	Roy Derbyshire, Crosby.	Mrs. J. Pyne	Roy Derbyshire.
Dominion	E. V. Hallady, Elgin	Miss Lucy Murphy	E. V. Hallady.
Elgin Model	Frank Leavins, Elgin	Miss Lottie Baker	Frank Leavins.
Home Factory	Jas. Somerville, Morton.	A. Dillon	Wm. Dean.
Maple Grove	S. M. Hallady, Elgin	Miss Lottie Baker	A. Ponnell.
Morton	Jas. Somerville, Morton.	A. Dillon	E. Virtue.
Ontario	J. H. Singleton, Smiths Falls.	Frank Bolton, Newboro.	L. Hough, Newboro.
Rockdale	J. R. Dargavel, Elgin	Geo. Wheeler, Jones Falls.	L. C. McBratney, Jones Falls.

Elizabethtown Township.

Anvern	E. McDougal, Fairfield E.	Mrs. A. Hudson	E. McDougal.
Glen Buell	R. Kelly, Addison	W. G. Percival, Glen Buell.	B. Scott, Glen Buell.
Greenbush	H. Davis, Greenbush	N. Olds	H. Davis.
Leeds Union	D. Dack, Lyn	S. Easton	D. Dack.
Lilly Springs	C. Whaley, Lilly Springs.	A. H. Hendry	C. Whaley.
Manhards	P. Hollingsworth, Manhards.	Miss J. Glasier	P. Hollingsworth.
Maple Grange	W. Greer, Spring Valley.	W. Greer	W. Greer.
North Star	Omer Davis, Lyn	Mrs. McCormac	Omer Davis.
Orchard Valley	J. Aldrich, Jellaby	J. O'Neil, Jasper	J. Aldrich.
Palace	H. Hollingsworth, Glen Elbe.	T. Beal, Athens	R. Latimer, Addison.
Perry Creek	Scott & Curry, Johnstown.	T. Curry	J. Redmond.
Redan	A. Pepper, Addison	M. Richards, Frankville	A. Pepper.
Rockspring	W. J. Moore, Rockspring.	J. O'Neil, Jasper	W. J. Moore.
Stanley	J. Raphiel, Mallorytown.	J. Robinson, Lyn	Chas. Walker, Lyn.
Star	L. McVeigh, Brockville.	F. Batin, Lyn	C. Henderson, Lyn.

Elmsley, S., Township.

Glen Elm	A. Cameron, Smiths Falls.	A. Cameron	C. S. Wiltsie.
Lombardy	J. H. Singleton, Smiths Falls.	A. Rabb, Lombardy	E. S. Jones, Lombardy.
x Rideau Star	H. Wells, Rideau Ferry.	A. Munsie	F. H. Timmins.
Rideau Queen	P. McEwan, Franktown.	M. Ballantyne, Smiths Falls.	R. Perry, Smiths Falls.

Escott Township.

Escott Centre	Arthur Bradley, Escott Centre.	D. Reid	Arthur Bradley.
x Escott Union	W. H. Warren, Rockfield.	L. Franklin	Ross Andrews.

LIST OF CHEESE FACTORIES IN EASTEEN ONTARIO.—*Continued.*

LEEDS COUNTY.— *Continued.*

Escott Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Junctown	W. T. Flood. Junetown.	W. H. Franklin	W. T. Flood.
Mitchelville	W. M. Kaiser. Mitchelville.	W. M. Kaiser	W. M. Kaiser.
Rockport	Wm. Landon. Rockport.	Miss H. Williams	Wm. Landon.
x Springfield Union	Patrick Donevan. Escott.	A. J. Shea	Fred. Gothier.
x Tilley	W. M. Foley, Tilley	W. M. Foley	Jas. Kirker.

Kitley Township.

Crystal Springs	S. E. Morrison. Eastons Cors.	Wm. Ferguson	S. E. Morrison.
Farmers' Friend	J. I. Smith. Frankville.	W. H. Montgomery	J. I. Smith.
Irish Creek	Everett & McDonald. Smith's Falls.	Geo. Harris, Jasper	Alf. Leacock, Jasper.
Newbliss	R. T. Beckett. Newbliss.	Mrs. Hitchcock	R. T. Beckett.
Standard No. 1	Seymour & Bellamy. Toledo.	Mrs. W. Nichol	Wm. Seymour.
Willow, No. 2	Donovan Bros. Toledo.	Miss Robb	E. A. Donevan.

Lansdowne Township.

Cold Brook	W. Mitchell. Lansdowne.	Miss Lucy Jack	W. Mitchell.
x Deerlick	J. B. Wilson. Gananoque.	J. B. Wilson	W. J. Lappin, Melcombe.
x Fairfax	Thos. McDonald. Melcombe.	Mrs. I. Cachrone	E. McNeill.
Island City No. 2	Kilborn & Davidson. Delta.	C. Copeland	W. W. Berney, Soperton.
x Lansdowne	W. Kaiser. Mitchelville.	W. M. Kaiser	Wm. Cosgrove.
Oak Leaf	W. Taylor. Charlestown.	Ab. Morris, Athens	W. Taylor.
x Rapids Valley	T. A. Bradley. Lansdowne.	G. A. Johnson	V. Turner.
Sand Bay	Robt. Grey. Sand Bay.	Max. Johnson	Robt. Grey.
x Selton	S. Latimer, Rockport	P. M. Wood, Ivy Lee	W. F. Foley, Ivy Lee.
x Warburton	Jno. Foley. Warburton.	Mrs. M. McCrea	Wm. Vanderberg.
x Wilstead	Jas. McNally. Wilstead.	Mrs. J. B. Wilson. Gananoque.	Frank Hall.

Leeds Township.

Clover Hill	E. Roantree, Berryton.	A. Dillon, Morton	E. Roantree.
Cheeseborough	S. S. Cheetham. Gananoque.	Mrs. J. B. Wilson	Thos. Isbester, Leeds.
Gananoque	R. Cunningham. Gananoque.	J. A. Webster	Geo. Williams.
Gem	P. McPartland. Westport.	P. McPartland	S. S. McCann, Taylor.
Gilt Edge	Jos. McAlonan. Seeley's Bay.	G. Maxwell	Jos. McAlonan.
Gold Glen	Chas. Pritchard. Ellisville.	A. Dillon, Morton	Herb. Kenny.
Gold Medal	Frank Wiltsie. Sweet's Cors.	Bryce White	Frank Wiltsie.
Green No. 972.	D. Green. Lyndhurst.	D. Green	T. E. Hudson.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

LEEDS COUNTY—*Continued.*

Leeds Township.—Continued.

Name of Factory.	Proprieter or President.	Secretary.	Maker.
Ideal Canada	Chas. Pritchard, Ellisville.	A. Dillon	T. J. Pritchard.
Long Point	Jno. Sykes, Long Point.	A. Dillon, Morton	Jno. Sykes.
Lorne	W. H. Kilborn, Gananoque.	Jas. Donevan	W. H. Kilborn.
Lyndhurst	P. Bresee, Lyndhurst.	Bryce White, Sweet's Cors.	Wm. Foley.
Marble Rock	H. Wilson & Son, Gananoque.	Jas. Donevan	W. Sliter.
Seeley's Bay	R. Gardiner, Seeley's Bay.	W. Ramsay	Louis Stevens.
Springfield	R. Wright, South Lake.	L. P. Shortell, Gananoque.	R. Wright.
Spring Vale	Louis Mustard, Elgin	A. Dillon, Morton	Jno. Godkin, Sweet's Cors.
Taylor	Thos. Anglin, Brewer's Mills.	W. Anglin, Taylor	E. Gallery, Taylor.
Wilson's No. 1	J. B. Wilson, Gananoque.	Mrs. McNinch	G. W. Brown.

Yonge Township.

Aberdeen	Jas. Ferguson, Caintown.	Robt. Hogan	Jas. Ferguson.
Barlow	G. Rowantree, Addison.	J. Hall	G. Rowantree.
x Caintown Union	E. Tenant, Caintown.	Viola Tenant	Roy Gibson.
Farmers' Choice	Wm. Henderson, Athens.	Mrs. F. Scovil	Wm. Henderson.
Farmersville	Jas. Henderson, Athens.	Ab. Morris	Jas. Henderson.
Glen Elbe	H. Hollingsworth, Glen Elbe.	R. Cornell, Athens	D. Cavanagh.
Leeds County	Mrs. J. S. Ferguson, Yonge's Mills.	E. L. Dickey	F. Ayer.
Mallory, A. W.	A. W. Mallory, Mallorytown.	A. W. Mallory	F. Blanchard.
x Mallorytown Union,	D. Forrester, Mallorytown.	D. Forrester	C. E. Leader.
New Model	Thos. Spence, Charlestown.	Thos. Beal, Athens	C. Moulten.
Union Valley	M. Topping, Athens.	R. Cornell	M. Topping.

LENNOX COUNTY.

Adolphustown Township.

x U.E.L.	Geo. Harrison, Adolphustown.	T. Gibbs	N. T. Hollis, Dorland.

Amhurst Is. Township.

Emerald	R. Instant Emerald	R. Instant	N. Palmer
Stella	Moutray & Sandwith, Stella.	W. H. Moutray	H. B. Sandwith.

Ernestown Township.

Bath	E. H. Phippen, Conway.	M. Rouse, Bath	D. Valleau, Bath.
Bay View	S. Greer, Collin's Bay.	T. D. Fairfield	H. Cavanah.
Empey,	Mrs. T. Empey, Switzerville.	Peter Miller	Mrs. T. Empey.
Farmers' Friend	Forrester & Metzlar, Bath.	Ashton Amy, Asslestine.	Jno. Forrester.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

LENNOX COUNTY.—*Continued.*

Ernestown Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Metzlar	Robt. Metzlar, Odessa.	Robt. Metzlar.	D. O'Keefe, Thorpe.
Odessa	W. H. Daugherty, Odessa.	J. C. Fraser	Robt. Daugherty.
Union	F. A. Perry, Chambers.	W. R. Smith	J. A. Clute, Morven.
Wilton	Robt. Metzlar, Odessa.	Robt. Metzlar	Jno. Hume, Wilton.

Fredericksburg, N., Township.

Napanee	S. C. Shorey, Napanee.	A. B. Schriver	S. C. Shorey.
Palace Road	F. W. Gerow, Napanee.	M. N. Empey, Switzerville.	F. W. Gerow.

Fredericksburg, S., Township.

Conway	E. H. Phippen, Conway.	E. H. Phippen	Alex. Murphy.
x Excelsior	W. Nolan, Hay Bay.	Fletcher Hall, Napanee.	O. M. Sandwith.
Sillsville	E. H. Phippen, Conway.	W. H. Rickley, Hayburn.	A. D. White, Sillsville.

Kaladar Township.

x Boundary	Jno. Bryden, Flinton.	Jno. Bryden	Robt. Thompson.
x Kaladar	Chas. Lessard, Flinton.	Chas. Lessard	Chas. Frost.

Richmond Township.

x Forest Mills	Chas. Anderson, Overton.	Chas. Anderson	Rubus Ackerman, Forest Hill.
x Kingsford	T. V. Sexsmith, Kingsford.	R. McCullough	S. Anderson.
Selby	Wood Bros, Selby	Ira B. Hudgins	Jno. Wood.

NORTHUMBERLAND COUNTY.

Alnwick Township.

x Roseneath	Arthur Tucker, Roseneath.	Walter Lane	R. W. Montgomery.

Brighton Township.

Codrington	R. A. Kenny, Codrington.	Isaac Striker	R. A. Kenny.
Cedar Creek	H. F. Way, Hilton	Imas Sprung	H. F. Way.
Brighton	R. Whitton, Brighton.	A. O. Maybee	Jno. Lonnergan.
New Evergreen	Thos. Dilworth, Myersburg.	K. B. Boothe, Norham.	Thos. Dilworth.

Cramahe Township.

x Avonabank	R. Moore, Morganston.	Heriman Reynolds, Norham.	J. F. Wilson.
Castleton	Jos. Taylor, Castleton.	C. A. Wilson	Jos. Taylor.
x Colborne	Alex. Rutherford, Colborne.	Jas. Conley	Geo. Wilson.
Edville	G. A. Gunner, Colborne.	C. S. Hinman, Edville.	F. Pierson, Edville.
x Salem	Dougal Bellamy, Colborne.	S. R. Dixon	O. W. Fenn.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

LENNOX COUNTY.—*Continued.*

Haldimand Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Centreton	H. R. Free, Coldsprings.	Miss C. Philip, Centreton.	Frank McIntosh, Centreton.
Burnley	H. A. Mitchell, Burnley.	Jno. Wilson	H. A. Mitchell.
x Fenella	Chas. Sherridan, Fenella.	Fred. Davoc, Roseneath.	W. D. Claffer.
x Grafton	Thos. Haskins, The Gully.	A. Spear	G. J. Immell.
Spring Valley	H. R. Free, Cold Springs.	M. Davy, Fenella	Geo. Devine, Burnley.
Wicklow	A. G. McDonald, Wicklow.	Jas. Thomas, Colborne.	A. G. McDonald.

Hamilton Township.

Baltimore	Fred. Cochrane, Baltimore.	W. Peters	Henry Immel.
Cold Springs	H. R. Free, Cold Springs.	Jos. Hardcaster, Cobourg.	Percy Grieve.
Crown	T. W. Philp, Elmview.	T. W. Philips	T. W. Philp.

Monaghan, S., Township.

Bensfort	S. Abbot, Lorenz.	W. T. Wood, Bensfort.	Wm. Uens

Murray Township.

x King	J. W. Crews, Trenton.	C. Ostrander, Glen Miller.	L. Reddick, Frankford.
x Rodgers	W. G. Locklin, Maple View	Geo. Pollard, Jr., Frankford	G. H. Pollard, Frankford.
x Wooler	S. T. Gunter, Wooler.	D. Leal	B. A. Reddick.
x York Road	W. Ireland, Smithfield.	Fred. Snider	A. Collins.

Percy Township.

Beaver	Jno. Duran, Campbellford.	Henry Wilson, Warkworth.	Walter Rutherford.
Brickley	Mrs. E. Drury, Brickley.	P. Jones	Mrs. E. Drury.
x Dartford	Jno. Allen, Warkworth.	Peter Ewing	Geo. Jackman, Dartford.
New Model	Geo. Ivey, Godolphin	Jno. Ivey	Geo. Ivey.
Norham	Irwin Gohean, Norham.	C. L. Cryderman	Irwin Gohean.
Percy	W. V. Drury, Warkworth.	I. Humphries	W. V. Drury.
x Shamrock, No. 1	Sam'l Beamish, Hastings.	Jas. O'Riely	W. J. Stillman, Clary.

Seymour Township.

x Brae	Alex. Keene, Burnbrae.	Gilbert Bedford	Wm. Southwell.
x Crow Bay	Alex. Anderson, Campbellford.	Wm. Pathrick, Campbellford.	Jno. Storms.
Empire	Jno. Kitchen, Campbellford.	W. S. Grills	Jno. Kitchen.
Forest	David Wallace, Menie.	Alex. Haig, Hoards' Sta.	David Wallace.
x Hoards	Fred. Jeffe, Hoards' Sta.	Fred. Jeffe.	Frank Little.
x I. X. L	Jno. Govan, Campbellford.	Martin McArthur	Robt. Maybee.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

LENNOX COUNTY.—*Continued.*

Seymour Township.— Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
x Kimberly	Geo. Third, Campbellford.	Thos. Locke	Alfred Brady.
x Myersburg	Wm. Owens, Myersburg.	Harry Pakenham	Thos. Hunter.
Prince of Wales	Jno. Murray, Burnbrae.	Jno. Clark, Campbellford.	Jno. Murray.
Rylestone	W. J. Irwin & Son, Sarginson.	Geo. W. Shortt, Springbrook.	Wesley Irwin.
x Seymour	Thos. Bedford, Campbellford.	Chas. West	Robt. Scott.
Stanwood	Malvin McComb, Stanwood.	Thos. Rowe	Malvin McComb.
Trent Valley	Whitton & Naylor, Campbellford.	Wm. Locke	Thos. McCaughan.
x Woodlands	Geo. Vanvolkenburg, Polmont.	Jno. McGrath, Campbellford.	Wm. Simpson, Campbellford.

PETERBOROUGH COUNTY.

Anstruther Township.

Apsley	A. W. Pattison, Apsley.	Robt. Hales	A. W. Pattison.

Asphodel Township.

Daisy D.	G. A. Barton, Norwood.	Chas. McNulty	G. A. Barton.
Norwood	D. A. Oakley, Norwood.	D. A. Oakley	D. A. Oakley.
Ormond	J. W. Valleau, Hastings.	Wm. Pickens	J. W. Valleau.
Westwood	R. McCracken, Westwood.	Jno. Breckenridge	R. McCracken.

Belmont Township.

x Oak Lake	Wm. Anderson, Round Lake.		Silas Green, Oak Lake.
Round Lake	T. D. Barton, Rush Point.	Jno. Wright, Havelock.	T. D. Barton.
Star	W. A. McMillan, Preneveau.	J. B. Peoples	W. A. McMullan.
Trent Bridge	Stephen Watson, Trent Bridge.	W. H. Johnston, Havelock.	C. M. Watson.
x Victoria	Robt. McKutchen, Rockdale.	Alex. Leeson, Havelock.	Howard Defoe, Havelock.

Burleigh Township.

x South Burleigh	Chas. Lander, Mount Julien.	Mrs. T. D. Church	N. E. James.

Chandos Township.

Chandos	J. F. Woodbeck, Lasswade.	Levi Bullied	F. Woodbeck.
x Clydesdale	D. S. Campbell, Clydesdale.	D. S. Campbell	J. M. Defoe.
Glenalda	F. M. Gooley, Glenalda.	Frank Gunter	F. M. Gooley.

Douro Township.

Maple Leaf	G. E. Wilson, Douro.	Maurice Condon	G. E. Wilson.
Pine Grove	R. H. Little, Lakefield.	W. J. Bullock	R. H. Little.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

PETERBOROUGH COUNTY.—*Continued.*

Dummer Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
x Killarney	Wm. McMillan, Norwood.	Fred. Gardiner	H. G. Bass.
x North Dummer	Frank Jory, Warsaw	Garfield Crowe	Geo. E. Parsons, Halls Glen.
Oakdale	E. G. Stephens, South Dummer.	Richard Ferguson	E. G. Stephens.
x Oak Leaf	Robt Morrow, Centre Dummer.	A. R. Wigmore, Norwood.	N. Wellman.
x Stoney Lake	Wm. Puffer, Clarina	Wm. Robb	Albert Langley
Warminster	David Taylor, Warsaw.	Robt. Bullock	G. A. Graham.
x Warsaw	E. Hawthorne, Warsaw.	S. R. Payne	Chas. Calder.

Ennismore Township.

King Edward	Richard Killen, Ennismore.	Paul Costelle	W. J. Winn.
Myrtle	J. P. Flood, Ennismore.	J. P. Flood	J. P. Flood.

Harvey Township.

x Buckhorn	W. J. McIlmoyle, Halls Bridge.	Mrs. R. Fawcett	H. J. Crowe.
x Cedarville	Alex. Thompson, Lakehurst.	A. Wilson	H. Holmes.
x North Harvey	R. Richmond, Nogies Creek.	Jas. McOliver, Bobcaygeon.	W. H. Merrill.

Monaghan, N., Township.

Fraserville	Jos. Madill, Fraserville.	Jos. Madill	W. J. Derby.

Otonabee Township.

Indian River	J. P. Andress, Indian River.	Frank Moher, Douro	A. L. Andress.
x Keene	Peter Drummond, Keene.	Jno. McFarlane	J. W. Smith.
Lang	Wm. Weir, Lang	Jno. E. Hope	Wm. Weir.
Otonabee Union	E. Deyell, Box 1051, Peterboro.	M. Stewart	Harold Wilson.
Shearer	Jas. J. Hogan, Jermyn.	Jno. Miller, Lang	Jas. J. Hogan.
Villiers	Jas. Ryan, Norwood.	Miss Maggie Shearer, Villiers.	Robt. A. Johnston.

Smith Township.

x Central Smith	J. A. McGregor, Peterboro.	J. A. McGregor	A. H. Campbell.
x Lakefield	Geo. E. Johnston, Lakefield.	G. W. Patrick	Egbert Demorest.
x Selwyn	Fred. McKee, Selwyn.	Robt. Duff	Thos. Borland.
Trewern	Jno. Chittick, Peterboro.	G. W. Mann, Bridgenorth.	Jno. Chittick.
Young's Point	Andrew Wilson, Youngs' Point.	A. A. Smith	Andrew Wilson,
Missing Link	S. Abbott, Lornez.	S. Abbott	G. W. Lorne, Fowler's Corners.

PRESCOTT COUNTY

Alfred Township.

Alfred	Victor Bertrand, Alfred.	T. Sandrieau	Victor Bertrand.
Bolt	S. Larocque, Alfred.	G. R. Brownfis, Alfred Centre.	D. Racine.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

PRESCOTT COUNTY.—*Continued.*

Alfred Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
C. T. No. 1	C. Tetreault, Gratton Cors.	C. Tetreault	C. Tetreault.
Empire	H. Gour, St. Thomas De Alfred.	H. Gour	H. Gour.
Empire B	M. Leclaire, L'Orignal.	Louis Philion	M. Leclaire.
H. C. No. 2	H. Contois, Lefaivre	J. Codieux	A. Contois.
J. Q. No. 1	J. Quvillion, Lefaivre	J. Quvillion	M. Quvillion.
J. Q. No. 2	J. Quvillion, Lefaivre	J. Quvillion	J. Quvillion.
Lot 5, Con. 6	A. Seinard, Alfred	J. Brisbois	A. Seinard.
Parrisien	G. B. Parrisien, Alfred.	G. B. Parrisien	M. Leclaire.
Plantaganet No. 2	A. Carriere, Curran.	P. Treadeau, Alfred Sta.	N. St. Jean, Alfred Sta.
Plantaganet	Jos. Charbonneau, Plantaganet.	C. Lalonde	J. Craig.
Stafford	Geo. Stafford, Treadwell.	H. Darlington	Geo. Stafford.

Caledonia Township.

Farmers' Fancy No. 1	W. B. Cameron, Sandown.	W. B. Cameron	W. B. Cameron.
Farmers' Fancy No. 2	A. J. Andrews, Rothier.	A. J. Andrews	A. J. Andrews.
G. No. 124	H. Gareau, St. Amour.	H. Gareau	H. Gareau.
J. B. No. 12	O. Denis, St. Isidore de Prescott.	O. Denis	X. Denis.
L. No. 1	D. Leroux, St. Amour.	D. Leroux	Jos. Leroux.
Minto No. 3	Neil Fraser, Vankleek Hill.	Neil Fraser	A. Groulx, Fournier.
Plantaganet No. 3	Chas. Terrian, Curran.	Chas. Therrian	A. Willette, Fournier.
Spring Grove No. 4	Louis Marston, L'Orignal.	Louis Marston	D. N. McPhee, McAlpine.
Spring Grove No. 5	Louis Marston, L'Orignal.	Louis Marston	H. Cadieux, Cassburn.

Hawkesbury, E., Township.

Ashgrove No. 2	Soloman Tittley, Chute a Blondeau.	Robt. Boa, Pt. Fortune.	W. Lature. Point Fortune.
Ashgrove No. 3	Soloman Tittley, Chute a Blondeau.	D. McAllister	Offord Desforges.
x Barb	Andrew Allison, Barb.	Geo. Ogden	H. Cuthbert.
Beech Grove	Wyman Bros.	D. B. Wyman	Jos. Desjardines.
Glen Andrew	A. A. McDonald, Glen Andrew.	A. A. McDonald	A. A. McDonald.
x Golden Hill	Thos. Vagan, Vankleek Hill.	Geo. Allen	R. J. Graham.
H. T. 504	Ovid Trudel, Montreal, Que.	Omer Brazeau, St. Eugene.	Lucien Baribeau, St. Eugene.
Highland	Oscar Lalonde, St. Eugene.	Oscar Lalonde	Oscar Lalonde.
J. G. No. 3	J. A. Giroux, Mongenais, Que.	J. Lalond	J. A. Gironx.
Maple Leaf No. 39	J. C. McAlpine, Glen Andrew.	J. C. McAlpine	J. C. McAlpine.
x Maple Row	J. A. McCallum, St. Eugene.	Nelson Brunett	A. Churchill, Barb.
Minto No. 5	Neil Fraser, Vankleek Hill.	A. McCallum, St. Eugene.	W. P. Boyer.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

PRESCOTT COUNTY.—*Continued.*

Hawkesbury, E., Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Minto No. 6	Neil Fraser Vankleek Hill.	Neil Fraser	W. J. Sloan, St. Eugene.
National No. 1	E. A. Ethier St. Anne de Prescott.	E. A. Ethier	E. A. Ethier.
National No. 2	E. A. Ethier St. Anne de Prescott.	E. A. Ethier	Horace Asselin.
x River View	J. B. Cadieux Point Fortune, Que.	J. B. Cadieux	Eugene Quesnell.
Spring Creek	Henry Renaud Plantaganet.	Nap. Labrose St. Eugene.	T. Brozeau, St. Eugene.
Spring Grove No. 8	Lewis Marston L'Orignal.	Louis Marston	P. O'Riley, Point Fortune, Que.
x Stardale	Geo. Mooney Stardale.	Jas. Allison	R. Byers.

Hawkesbury, W., Township.

x Aberdeen	Stephen Bond Vankleek Hill.	Colin Northcote	Herb. Sarginson.
x C.P.R.	G. A. Fitzpatrick Vankleek Hill.	Jos. Simes	Jos. Simes.
x Hawkesbury	C. E. Myers. Stepney.	G. O. Higginson	Alfred Garrett.
Riverside	Jno. P. Sarges Grenville, Que.	Jno. P. Sarges	V. A. Morrison, Hawkesbury.
Spring Grove No. 1	S. N. Morrison Vankleek Hill.	S. N. Morrison	P. Quindon.
Spring Grove No. 3	Lewis Marston L'Orignal.	Lewis Marston	Adolphus Deyotte.
Spring Grove No. 6	Lewis Marston L'Orignal.	Lewis Marston	Geo. Valley, Vankleek Hill.
Spring Grove No. 7	Lewis Marston L'Orignal.	Lewis Marston	Alphonse Nicholas, Frasers' Ridge.

Longueuil Township.

Canadian T. P.	T. Parrisien L'Orignal.	Miss Villmere	T. Parrisien.
Mount Royal	L. Larocque, Alfred	L. Larocque	A. Laviolette.

Plantaganet, N., Township.

A. No. 35	S. St. Piere Roolway.	Jno. McKinley Plantaganet.	Jas. McGant, Plantaganet.
A. F. W. No. 1	A. Forthier Wendover.	L. Villeneuve	W. Cadieux.
Centre	Jos. Bourbonais Senecal.	Jos. Bourbonais	Jos. Bourbonais.
C. T. No. 3	C. Terrier, Curran	J. McKinley Plantaganet.	Paul Couture.
F. No. 32	Charbonneau & Gratton, Wendover.	U. Gratton	P. Perrier.
G. No. 604	E. Brown, Chard	S. Brown	E. Brown.
G. No. 868	Jos. Seguin Alfred Sta.	M. Parent	Jos. Seguin.
Grand River	Adolphus Gauthier Jessop Falls.	A. Gauthier	Jno. Watson, Treadwell.
O. B	O. Beaulne, Curran	O. Beaulne	W. Gagnon.
Plantaganet No. 6	A. Boileau, Curran	J. Presley	B. Dicaire.
River Valley	A. Therrien, Curran	J Stone, Russell	E. Major, Centrefield.
T. W. No. 1	Qusnell & Chabitt Treadwell.	G. Snecal	T. Chabitt.

Plantaganet, S., Township.

A. No. 46	R. Swerdfager Westminster.	R. Swerdfager	R. Swerdfagar.
Aurora	Jos. Dubois St. Isidore de Prescott.	Jos. Dubois	Jos. Dubois.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

PRESCOTT COUNTY.—*Continued.*

Plantagenet, S., Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Fournier No. 89	Jno. A. McLeod Fournier.	Jno. A. McLeod	Jno. A. McLeod.
G. No. 557	Geo. Seguin, Riceville.	Geo. Seguin	Geo. Seguin.
x G. No. 871	Jules Denis, Lalond	Jules Denis	J. Groulx.
J. B. No. 1	Lud. Groulx. Rose Corner.	Lud. Groulx	Lud. Groulx.
J. L	J. Lemieux, Fournier.	J. Lemieux	J. Lemieux.
Nation River	J. A. Dixon, Lemieux.	J. A. Dixon	J. A Dixon.
Pendleton	Jos. Rezon, Pendleton.	Chas. Farrell	Jos. Rezon.
x Riceville	A. Metcalf, Riceville.	A. Metcalf	
W. S	R. Levac. St. Isidore de Prescott.	Jos. St. Denis	R. Levac.

PRINCE EDWARD COUNTY.

Ameliasburg Township.

x Hyland	S. A. Vancott Ameliasburg.	F. C. File	Jas. A. Mitchell.
x Massassaga	A. G. Simmonds Rossmore.	D. W. Valleau	J. W. Moore.
x Mountain View	J. Simmonds Rossmore.	A. J. Cotter	Jno. Hall.
x Quinte	C. H. Babbit Rossmore.	W. E. Anderson	A. Vandusen, Rednerville.
x Wellars Bay	Jas. A. Johnston Consecon.	A. P. Cox	Chas. Carter.

Athol Township.

Cherry Valley	W. S. Blakely Cherry Valley.	Wm. Moore	W. S. Blakely.

Hallowell Township.

Allisonville	Geo. Ferguson Allisonville.	Jno. Wilson Wellington.	Geo. Ferguson.
Bloomfield	Walter Leavens Bloomfield.	W. L. Hubbs	Geo. Sherriff.
x Union Vale	B. A. Reynolds. Picton.	H. J. Vincent	F. A. Miller.

Hillier Township.

x Cloverdale	H. H. Post Wellington.	Geo. McCartney Rose Hall.	Geo. Carter, Hillier.

Marysburg, N., Township.

Cressy	A. Phippen. Prynier.	E. Harrison, Picton.	A. Phippen.
Union	Upson McConnell Picton.	Samuel Martin	Upson McConnell.
Waupoos	Jas. H. Carter. Picton.	R. Rose, Waupoos, E.	Jas. H. Carter.

Marysburg, S., Township.

x Black River	Wm. Yorke. Black River Bridge.	Jos. McCauley, South Bay.	Ira Chandler.
Point Traverse	McLaughlin Bros. Point Traverse.	Thos. Rose, South Bay.	Geo. Hudgin, South Bay.
Royal Street	Geo. McConnell. Milford.	Jno. R. Gibson, Point Petre.	Geo. McConell.

Sophiasburg Township.

x Ben Gill	Walter Clark Bloomfield.	H. H. Huff	Jas. E. Carter.
x Bethel	W. A. Foster Bethel.	Wm. Rightmire	Wm. Horsey,

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

PRINCE EDWARD COUNTY.—*Continued.*

Sophiasburg Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
x Elmbrook	W. S. Benson, Picton.	Fred Wood, Picton	R. Carter, Elmbrook.
x Elmwood	R. Dunning. Demorestville.	G. L. Morden	W. J. Hicks.
x Maple Leaf	Alfred Foster. Fish Lake.	Horace Way	Wm. Anderson.
x Northport	W. F. Robinson Northport.	D. H. Fraser, Northport.	Geo. Emly.

RENFREW COUNTY.

Admaston Township.

Admaston	C. L. McCrady Balsam Hill.	C. L. McCrady	A. Tetlock, Admaston Sta.
x Bonnechere Valley	D. Campbell Admaston.	Thos. Lyons	J. Morphy.
Union Star	Walker & Walker Northcote.	Thos. Atkinson	A. Walker.

Alice Township.

C. & L. No. 1	Cotnam & Livingstone Alba.	W. Coburn, Shady Nook.	Geo. Bremner, Shady Nook.

Bromley Township.

Maple Hill	G. M. Gibson Douglas.	T. P. Gorman, Pine Valley.	Ernis Weatherly.
Osceola	Singleton & Son Smiths Falls.	Isaac Greeny, Osceola.	Frank Eaton, Osceola.
Stonebrook No. 3	R. Watson Douglas.	Thos. Thrasher	R. Watson.

Grattan Township.

Grattan	G. M. Gibson Douglas.	J. Foster, Grattan	C. Curtis, Grattan.

McNab Township.

x Glasgow Sta	Jno. Carswell Glasgow Sta.	A. Murphy	J. A. Ready.
Madawaska	Croft & Morris. Burnstown	J. Forest	S. E. Morris.
x Pine Grove (McNab)	J. Tierney. Arnprior.	J. Tierney	R. J. Anderson.
Waba	Jas. Cox. Waba.	Jno. Stewart	Jas. Cox.

Matawatchan Township

Star	J. Wilson. Matawatchan.	J. Wilson	T. Love.

Pembroke Township.

Greenwood	Singleton & Son Smiths Falls.	Jno. Cotnam, Alba.	M. J. Livingstone.

Ross Township.

Cobden	Singleton & McKenney Smiths Falls.	W. H. Collins.	E. McKenny.
Forresters Falls	J. H. Jackson. Forresters Falls.	W. E. Ross	J. H. Jackson.
Queen's Own	Walker & Walker Northcote.	S. Walker.	Milton Hudson, Haleys.

Stafford Township.

Micksburg	A. Taylor. Pembroke.	J. Kidd, Micksburg	H. Kincaid, Micksburg

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

RENFREW COUNTY.—*Continued.*

Westmeath Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Beachburg	Singleton & Hough, Kingston.	J. Benny, Beachburg.	
Snake River	A. J. McLaren, Cobden.	A. J. McLaren	Jno. Best, Snake River.
Westmeath	Singleton & Park, Westmeath.	A. Tims	A. Park.

Wilberforce Township.

Equal Rights	J. L. McGibbon, Eganville.	Miss M. Lett	Chas. Gray.
Rankin	W. L. Salter, Rankin.	S. Greer	W. L. Salter.

RUSSELL COUNTY.

Cambridge Township.

Boundary No. 1	Jos. Groulx, Casselman.	Jos. Groulx	Jos. Groulx.
Cambridge No. 1	G. Casselman, Casselman.	G. McCauley, Martel Corners.	E. Lafleche.
x Cambridge No. 5	E. Thibault, Longtinville.	O. Mahen	O. Thibault.
x Casselman Ass'n	A. Lalonde, Casselman.	J. Racine	J. Portelance.
x Grassland	J. B. Lauzon, St. Albert.	F. Blanchard	M. Duhame.
J. B. No. 5	Jos. Bertrand, Gagnon.	Jos. Bertrand	Jos. Bertrand.
J. D. No. 8	I. Denis, Lem eux.	J. Benson	I. Denis.
J. D. No. 9	I. Denis, Lemieux.	Jos. Menard, The Brook	A. Denis.
x Mayersville	P. Benoit, Mayersville.	G. Sanche	E. Lafleche.
Midnight Sun No. 1	A. A. Casselman, Casselman.	Jos. Racine	Ed. Rainville.
Midnight Sun No. 3	J. R. Lefleche, Casselman.	C. Hutt	J. R. Lafleche.
x Midnight Sun No. 4	L. Brisson, Benoit	L. Brisson	A. Matte.
R. No. 2	D. Racine, Casselman.	D. Racine	A. Laflante.
x St. Adrien	Fred. Adams, Casselman.	Jos. Adams, St. Albert.	J. Leduc, St. Albert.
x St. Albert	J. Pinsaneault, St. Albert.	A. Clement	R. Cousineau.
Letrum	J. D. McPhail, Russell.	V. Racette, South Indian.	S. Racette, South Indian.
x Sunny Side	J. Armstrong, Crysler.	M. Coons	C. Hutt.

Clarence Township.

No. 238	Fred. Houle, Rockland.	Fred. Noil, Clarence Creek.	M. Fortis, Clarence Creek.
A. 45	Cyril St. Pierre, Chard.		
Canada	O. Lafleur, Clarence Creek.	J. Presley	O. Lafleur.
Canada No. 2	W. W. Charbonneau, Vinette.	W. W. Charbonneau	W. W. Charbonneau.
Canada No. 225	E. Lafleur, Clarence Creek.	Chas. Desjardines	E. Lafleur.
Chard	E. Sarigne, Chard	E. Sarigne	E. Sarigne.
Cobs Lake	S. Oullette, The Lake	S. Oullette	A. Larvie.
C., No. 5	Magloire Landry, Clarence Creek.	J. M. Landry	J. Seguin.
Ettyville	W. J. McAuly, Ettyville.	W. J. McAuly	F. Wright.
x Farmer Co	Geo. Ducharme, Vinette.	M. Wolf	Geo. Ducharme.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

RUSSELL COUNTY.—*Continued.*

Clarence Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Green Bank	E. Lalonde, Orient	E. Lalonde	Jas. Shane.
Greenwood No. 2	A. Nelson, Vars	A. Nelson	A. Nelson.
Hammond	W. J. Charbonneau, Hammond,	Jos. Guandon	W. J. Charbonneau.
Higher Brook	Fred. Menard, Cheney Sta.	M. Emery	Fred. Menard.
North Indian	Geo. Cardiff, Hammond.	Geo. Cardiff	Geo. Cardiff.
Ottawa Valley	Forthier & Thivierge, Clarence Creek.	J. Fortier	Piere Belanger.
Ottawa Valley No. 2	A. Gelineau, The Brook.	Jos. Menard	A. Gelineau.
Stonebrook, No. 1	Eli Watson, Cumberland.	M. Nolan, Cannan	A. Manders, Pendleton.
The Brook	N. Gendron & Son, The Brook.	Geo. Menard	Ed. Gendron.
x The Brook Co	J. Labelle, The Brook.	N. Langton	J. Lalonde.

Cumberland Township.

Alpine No. 2	N. E. Ronan, Russell.	Mrs. Jas. Tierney, Carlsbad Springs.	B. W. Hollister, Carlsbad Springs.
Century	D. Deguire, Danniston.	J. Taylor	G. Duchame.
Greenwood	A. Nelson, Vars	A. Nelson	Jno, Wylie, Leonard.
Gilt Edge	J. D. McPhail, Russell.	A. Eadie, Vars	Chas. Markley, Vars.
Hillside	J. S. Martin, Chartrand.	J. S. Martin	J. S. Martin.
McGregor No. 1	A. McGregor, Navan.	Jas. Findlay	A. McGregor.
Millbrook No. 1	E. Tucker, Clarence.	Miss Robinson	R. R. Tallman.
x Millbrook No. 2	W. Wilson, Sarsfield.	W. Wilson	Jno. McKerracher, Cumberland.
Morning Star No. 1	W. H. Olmstead, Bearbrook.	W. H. Olmstead	W. H. Olmstead.
Morning Star No. 2	Olmstead & Dewar, Vars.	W. H. Olmstead, Bearbrook.	K. Dewar, Vars.
Navan	M. Rathwell, Navan.	Jas. Cotton	M. Rathwell.
Perfection	Frank Reid, Hammond.	Thos. Birch	Frank Reid.
Russell No. 14	W. H. Rivington, Cumberland.	Jno. Gamble	A. Barber.
Sarsfield	E. Lafleur, Sarsfield	E. Lafleur	Jos. Lafleur.
Windsor Star	Jas. Legault, Danniston.	L. Lafleur, Borromee	A. Legault, Borromee.

Russell Township.

E. W. No. 8	Wm. Eager, Morrisburg.	Adalore Marion, Felton.	Arthur Serviss, Felton.
E. W. No. 29	Wm. Eager, Morrisburg.	O. Bourdeau, Forgette.	C. Lafansie, Forgette.
Farmer's Joy	P. Bordeau, Longtinville.	Jos. Bordeau	Jos. McAllister.
Fraser No. 1	Wm. Fraser, Felton.	Wm. Fraser	Wm. Fraser.
Fraser No. 2	Wm. Fraser, Felton.	Wm. Fraser	Wm. Fox.
x Golden Globe	Alfred Morrow, Russell.	Geo. Hayes	G. R. Empey.
Levesque	J. N. Levesque, Embrun.	J. N. Levesque	J. Bourbonnais.
Menard No. 1	L. Menard, Embrun.	L. Menard	D. Lefall.
P. Brisson No. 1	P. Brisson, Brisson	E. Champagne	Art. O'Neil.
R. No. 1	D. Racine, Casselman.	F. Diguard, Embrum.	P. Quenneville, Embrun.
Riverside	Petrie & McKewan, Russell.	T. Fitsimmons	Jno. Hamilton.
St. Onge	C. St. Onge, St. Onge.	C. St. Onge.	Jos. Lavictoire.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

RUSSELL COUNTY.—*Continued.*

Russell Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Springhill No. 1	A. Herrington, Russell.	A. Hetsman	A. Herrington.
Springhill No. 2	Wm. Morrison, Pana.	Miss Herrington Russell.	Wm. Morrison.
White Star	D. N. McGregor Russell.	A. J. Becker	D. N. McGregor.

STORMONT COUNTY.

Cornwall Township.

x Black River No. 1	J. D. J. McDonald Harrisons Cors.	Miss M. A. McDonald.	Alex. Seymour, St. Andrews.
Cornwall Gems	Jas. Irvine	Jas. Irvine	Alex. Cameron.
	Grants Cors.		
Farmers' Choice	Allen Loney Tyo Town.	Gilbert Ramsay	Wm. Finkle.
x Farmers' Lee	W. J. Johnston Eamers' Cors.	Albert Cline	R. J. Hoople, Cornwall.
Glencoe	D. A. Harris Bonville.	A. D. McI'hail	W. G. Harris.
Island	W. J. Quinn St. Andrews.	D. W. McDougall	W. J. Quinn.
x Lake View	M. Warner Mille Roches.	M. Warner	Hugh Warner.
McMillan's Corners	J. A. Robinson McMillan's Corners.	A. J. A. McDonald	J. B. McDonald.
May's Fancy	J. B. May Eamer's Corners.	W. J. McLeod Cornwall.	Herman Kirkey.
x Moulinette	J. G. Snetsinger Moulinette.	J. G. Snetsinger	J. R. Burton.
St. Andrews	S. G. Lawson. St. Andrews.	Miss M. McDonald St. Andrews.	S. G. Lawson.
White Rose	Jas. A. Tobin Cornwall Centre.	Jas. A. Tobin	Jas. J. Tobin.

Cornwall Island Township.

Cornwall Island	L. White Cornwall Island.	Miss Roundpoint	Jas. Russell.

Finch Township.

Berwick No. 1	M. Patterson, Berwick.	M. Patterson	L. Hutt.
Berwick No. 2	M. Patterson, Berwick.	D. McLean	Albert Blair.
C. W. No. 2	J. D. McPhail. Russell.	Wm. Campbell. Cannamore.	J. Bolton, Cahore.
x Central	G. D. Scott, Berwick.	J. R. Simpson	Anson Mattice.
x Crysler	Soloman Legault Crysler.	Wm. Paul	Archie Smirl.
x Finch Co	B. Adams, Finch	B. Adams	Herbert Pyke.
x Goldfield Co	Jas. McMahon, Finch.	Jno. Farrell	Henry Clark.
Gold Leaf	F. Durivage Casselman.	F. Durivage	R. Mattice, Avonmore.
Hutt No. 1	Lorne Hutt, Berwick.	Jno. Pollock	Lorne Hutt.
Loraine	Chas. Chambers. Chesterville.	Jas. King	Chas. Chambers.
McLean No. 2	G. L. McLean, Finch.	Tom. McDonald. Chesterville.	M. S. Wilkins.
McLean No. 4	Lorne McLean, Finch.	Jas. Simpson	Lorne McLean.
McLean No. 5	Geo. McLean, Finch.	Geo. McLean	E. Peopst, Newington.
McLean No. 7	Geo. McLean, Finch.	Geo. McLean	M. Onderdirk.

Osnabruck Township.

Bomen's No. 1	H. Bomen Newington.	H. Bomen	Jno. Carr.
Bomen's No. 2	H. Bomen Newington.	H. Bomen	Rodney Simpson.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.—*Continued.*

STORMONT COUNTY.—*Continued.*

Osnabruck Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Bomen's No. 3	H. Bomen, Newington.	Mrs. Alvin Eamer, Dixon's Corners.	F. Stanford, Dixon's Corners.
Edwards No. 2	W. A. Edwards, Gallingertown.	H. Hodgins	Jno. McCallum.
Edwards No. 4	W. A. Edwards, Gallingertown.	Jno. Loucks, Aultsville.	Arthur McCallum.
Farmers' Joy, No. 1	B. Tinkess, Osnabruck C.	B. Tinkess	Ralph Alguire, Northfield.
Farmers' Joy, No. 3	B. Tinkess, Osnabruck C.	B. Tinkess	H. Wilson.
x Farren's Point	Jno. S. Morgan, Osnabruck C.	H. A. Morgan	G. H. Alguire.
x Grantley	Hugh Robinson, Grantley.	Jas. Carr	H. McMillan.
Lunenburg	Grant & Wert, Lunenburg.	Jno. Grant	Jno. Grant.
x Sweet Briar	Thos. Tobin, Dickenson's Landing.	Mrs. J. Anderson	Thos. Tobin.
x Wales	C. S. Baker, Wales.	Oscar Eamon	R. Pyke.

Roxborough Township.

x Bloomington	Peter McEwen, Maxville.	Sandy McEwen	Edwin McVeigh.
Canadian Produce	H. Villeneuve, Moose Creek.	H. Villeneuve	H. Villeneuve.
Circle No. 2	W. O. Wert, Avonmore.	W. O. Wert	R. Baker.
Circle No. 3	W. O. Wert, Avonmore.	W. O. Wert	C. McIntyre.
Circle No. 4	W. O. Wert, Avonmore.	W. O. Wert	Percy Bender.
Circle No. 5	W. O. Wert, Avonmore.	W. O. Wert	Jno. McLean.
Circle No. 6	W. O. Wert, Avonmore.	W. O. Wert	Chas. Pyke.
Circle No. 7	W. O. Wert, Avonmore.	W. O. Wert	Dan. Rahl.
Farmers' Joy	W. J. Buell, Gravel Hill.	M. M. Crawford	W. J. Buell.
Farmers' Joy, No. 2	B. Tinkess, Osnabruck, C.	B. Tinkess	Stephen Delaney, Avonmore.
Glenelg	Alex. Lafless, Moose Creek.	Wm. Grant	Archie Stewart.
Golden Tips No. 2	Ovilda Bourgon, Moose Creek.	Jno. McCrea	Ovilda Bourgon.
McLean's No. 1	Geo. McLean, Finch	Geo. McLean	Sandy Clark.
Moose Creek, No. 1	Geo. Fusee, Moose Creek.	Nelson McCrea	Geo. Fusee.
x Roxborough	Jno. McCrea, Gravel Hill.	Mack. Prideam	Jno. Bentley.
x Sandringham	Alex. Fraser, Sandringham.	D. McDermid	E. L. Blair.
x Strathcona	D. J. McDonald, Strathcona.	D. J. McDonald	Jno. Snetsinger.
Sunrise No. 4	N. McCrea, Athol	Chas. Morrow, St. Elmo	Geo. Sorell, St. Elmo.

VICTORIA COUNTY.

Emily Township.

x East Emily	W. Deyell, Fowler's Corners.	J. F. Collins, Ennismore.	Wm. Purdy.
Maple Leaf	Cecil Reid, Downeyville.	M. Costelle	Cecil Reid.
Omemee	Jno. A. Tedford, Omemee.	Fred. Nugent	Jno. A. Tedford.

LIST OF CHEESE FACTORIES IN EASTERN ONTARIO.— *Concluded.*

VICTORIA COUNTY.—*Continued.*

Fenelon Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Fenelon Falls	H. A. McIntosh, Fenelon Falls.	H. A. McIntosh	Martin Stillman.

Mariposa Township.

x Mariposa	R. P. Hill, Woodville.	H. Fowler, Linden Valley.	P. J. Gray.

Ops Township.

x North Ops	Thos. Flynn, Lindsay.	Jas. Agnew	Michael Murphy.
x Pine Grove	Geo. Murphy, Lindsay.	P. Greenan	M. Murphy.
x Reaboro	Geo. Rea, Lindsay	W. J. McNevin, Reaboro.	R. G. Allen, Reaboro.

Verulam Township.

Bobcaygeon	Kelso & Moore, Bobcaygeon.	G. W. Taylor	Jos. Kelso.
x Dunsford	S. Thurston, Dunsford.	J. A. Kennedy	Wm. Wright.
x North Verulam	B. Smith, Fairbairn	E. Tiers	C. A. Moffatt.
x Red Rock	Jno. Knox, Fenelon Falls.	J. W. Staples, Red Rock	J. H. Anderson, Red Rock.
Star	A. Beavis, Dunsford.	Isaac Lewis	Fred Herchemer.

LIST OF CHEESE FACTORIES IN WESTERN ONTARIO.

BRANT COUNTY.

Burford Township.

*Combined cheese and butter factories.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Cathcart	Fred. Costin, Cathcart.	C. Kelly	A. McWebb.
Harley	Wm. Jackson, Harley.	F. Casner	W. Jackson.
Kelvin	Wm. Jamieson, Kelvin.	W. Jamieson	W. Jamieson.
New Durham	Jas. Patterson, New Durham.	P. Kelly	R. Recher.

Brantford Township.

Cockshutt Rd	Jno. Wilson, Burtch.	Miss Bailey, New Port.	J. Wilson.
x Grand River	Geo. Hatley, Brantford.	Geo. Hatley	J. Black, Cainsville.
Mt. Pleasant	A. W. Robertson, Mohawk.	A. W. Robertson	H. Caswell.

Oakland Township.

Scotland	A. W. Robertson, Mohawk.	A. W. Robertson	C. O'Riley, Scotland.

BRUCE COUNTY.

Huron Township.

x Huron	J. Harrison, Kincardine.	W. Lindsay, Ripley	T. Nimmo.
x Paramount	J. Barnaby, Lucknow.	J. Barnaby	H. Youn.

LIST OF CHEESE FACTORIES IN WESTERN ONTARIO.—*Continued.*

BRUCE COUNTY.—*Continued.*

Huron Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
x Pine River	J. Lindsay, Pine River.	D. Blue, Amberley	W. A. Bell.
x Ripley	W. H. Farnell, Ripley		M. Watts.

Kincardine Township.

x Millarton	W. Pollock, Kincardine.	Miss Stewart, Millarton.	J. McKenney, Millarton.

DUFFERIN COUNTY.

Amaranth Township.

x Laurel	S. T. Ranton, Laurel	R. Fife	S. T. Ranton.

Melanchton Township.

Conover	T. H. Cornett, Shelburne.	T. H. Cornett	
x Jessopville		Wm. Anderson, Jessopville.	A. M. Reid, Jessopville.

Mulmur Township.

Lavendar		Jas. Johnston, Lavendar.	Frank Sinclair, Lavendar.

ELGIN COUNTY.

Aldborough Township.

Crinan		J. D. McIntyre, Crinan.	J. Thompson, Crinan.
West Lorne	C. Beckett, West Lorne.	Miss Harris	C. Beckett.

Bayham Township.

Firby	D. C. Floto, Corinth	O. Veitch	D. C. Floto.
New England	C. C. Travis, Eden	C. C. Travis	A. Ronson, Acacia.
x Straffordville	A. Carnes, Straffordville.	W. Yeandle, Bayham.	Z. A. Leach.
x Vienna	R. McLean, Vienna	S. T. Jackson	S. T. Jackson.

Dorchester, S., Township.

Avon	A. J. Kerrick, Avon		A. J. Herrick.
Lyons	Wm. Boyes, Lyons	Ed. Martin	J. M. Gordon.
* Springfield	J. H. Mannell, Springfield.	J. H. Mannell	J. H. Mannell.

Malahide Township.

Dunboyne	Jno. Wardle, Dunboyne.	R. H. Lindsay, Copenhagen.	Jno. Wardle.
x Lakeview	M. B. Hagan, Lakeview.	H. G. Moore	A. McHerries.
Northwood	W. Baker, Kingsmill	C. W. Thompson, Aylmer.	W. M. Godby.
x Seville	O. Baker, Seville	Jno. Abell, Seville	Wm. Lanyon.

Southwold Township.

Paynes Mills	C. M. Firby, Talbotville.	Jno. Barnes	C. M. Firby.
* Sheddon	G. G. Hopkins, Sheddon.	G. G. Hopkins	D. J. Dwyer.
* West Magadala	R. R. Cranston, Lawrence, Sta.	R. R. Cranston	R. R. Cranston.

LIST OF CHEESE FACTORIES IN WESTERN ONTARIO.—*Continued.*

ELGIN COUNTY.—*Continued.*

Yarmouth Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
* Mapleton	Jno. Brodie Mapleton.		J. McNamara.
Sparta	Chas. McCulloch Sparta.	A. A. Clark	C. McCulloch.
Union	M. Hepburn, Union	W. Donnelly	J. T. Donnelly.
Yarmouth	Thos. Brunskill Yarmouth Centre.	A. Glorin Yarmouth.	T. Brunskill.

GREY COUNTY.

Proton Township.

x Dundalk	H. Richardson Dundalk.		H. Richardson.

HALDIMAND COUNTY.

Canboro Township.

Canboro	J. N. Paget, Canboro.	J. N. Paget	W. J. Goodwin.

Cayuga, S., Township.

South Cayuga	Wm. Frier, S. Cayuga.	Wm. Frier	Wm. Frier.

Moulton Township.

Attercliffe Sta	O. J. Smith Attercliffe.	O. J. Smith	Jno. Koch.
Harrington	J. Harrington.	J. Harrington	J. Harrington.

Oneida Township.

Clanbrassil	C. W. Ames Clanbrassil.	C. W. Ames	C. W. Ames.

Seneca Township.

Caledonia	Richardson & Hainer Caledonia.	H. Cowie	J. A. Hainer.
York	B. Bond, York	B. Bond	B. Bond.

Walpole Township.

Hagarsville	W. Kaufman Hagarsville.	W. Kaufman	H. Cantelon.
* Jarvis West	J. J. Parsons, Jarvis.	J. J. Parsons	G. Agur.

HURON COUNTY.

Grey Township

Ethel	J. K. Brown, Ethel.	M. Crowder	J. K. Brown.
x Molesworth	D. Campbell Molesworth.	D. Menzies	D. Menzies.

Howick Township.

x Fordwich	J. Aldrich, Fordwich.	M. Daum Kurtzville.	O. Proudlove.

Goderich Township.

x Holmesville	N. Trewerthy Holmesville.	N. Trewerthy	E. G. Williams.

LIST OF CHEESE FACTORIES IN WESTERN ONTARIO.—*Continued.*

LAMBTON COUNTY.

Rosanquet Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
x Arkona	T. A. Lampman, Arkona.	E. M. Dowell, Arkona.	A. G. Wright, Widder.
x Ridgetree	D. Smith, Thedford	Wm. Trick	Ed. Phelps.

Brooke Township.

*Inwood	R. J. Richardson, Inwood.	A. Wilkes, Inwood	Chas. Hanley.
Walnut	F. McEwan, Watford	J. D. Carroll	Geo. McEwan.

Moore Township.

*x Brigden	Jno. Duncan, Brigden	Jas. Doolan	T. A. Stevens.
Colinville	C. White, Colinville	C. White	C. White.
x Osborne	F. Miller, Osborne	A. W. Elliott	A. Muxworthy.

Plympton Township.

Gala Bank	J. W. Symington, Gala Bank.	J. W. Symington	Wm. Reid, Camlachie.
Uttoxeter	J. S. Clark, Warwick.		
*Wyoming	Duncan Doan, Wyoming.	D. Anderson	D. Doan.

Sombra Township.

x Wilkesport	W. G. Wylie, Wilkesport.	A. Thompson	

Warwick Township.

*x Maple Grove	W. G. Hall, Birnam	Jas. Campbell, Forest	J. B. Doan.
Warwick	J. S. Clark, Warwick	N. Herbert	J. S. Clark.
Watford Union	F. McEwan, Watford	Wm. Kelly	F. McEwan.

LINCOLN COUNTY.

Caistor Township.

Caistorville	Wm. Bell, Caistorville.	J. Lyons	J. Lyons.

Gainsboro Township.

Bismark	A. Schrumm, Bismark.	J. Heslip	R. Schrumm.

Grimsby Township.

Smithsville	W. L. Harrington, Smithville.	A. D. Middaugh	W. L. Harrington.

MIDDLESEX COUNTY.

Adelaide Township.

* Keyser	H. E. Wilson, Keyser	Mrs. Davidson, Arkona.	J. E. Wilson.
* Strathroy	Dr. McCabe, Strathroy.	J. H. McIntosh	A. D. Smith.

Caradoc Township.

Mt. Carmel	D. Leitch, Roome	D. Leitch	E. Beeton.
Muncey	Jno. Stewart, Burwell Rd.	Geo. Carruthers, Christina.	R. Wood.

LIST OF CHEESE FACTORIES IN WESTERN ONTARIO.—*Continued.*

MIDDLESEX COUNTY.—*Continued*

Delaware Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Delaware	Fred Boyes, Lambeth	J. M. Kaiser, Howlett	F. Boyes.

Dorchester, N., Township.

Burnside	Geo. A. Boyes	F. Alliston	M. Noad.
	Putnam.		
Crampton	W. L. Bongard	W. L. Bongard	W. L. Bongard.
	Crampton.		
Dorchester Sta	C. R. Partlow	P. N. Way	C. R. Partlow.
	Dorchester.		
x Dorchester Union	T. McFarlane	A. F. Rogers	C. G. Smuck.
	Dorchester.		
Gladstone	Frank Boyes	A. Dodd, Derwent	Frank Boyes.
	Dorchester.		
Gore	Jno. Stubbs	Jno Stubbs	Jno. Stubbs.
	Crampton.		
* Harrietsville	S. E. Facey	F. Kuntz	S. E. Facey.
	Harrietsville.		
Mossley	Jno. Walthers	W. Scott	J. Walthers.
	Mossley.		
x Thames	A. E. Gracey	Miss Gilmour, London	N. E. Neville.
	Dorchester.		Nilestown.

Ekfrid Township.

Appin	M. R. Brown, Appin.	M. R. Brown	M. R. Brown.

Lobo Township.

x Lobo	J. D. Campbell		Geo. B. Brodie.
	Komoka.		Glenworth.

London Township.

Ballymote	Geo. Kenney	Geo. Lewis	Geo. Kenney.
	Ballymote.		
x Devizes	Ed. Bisbee, Devizes	F. Bebgea	Thos. Napier.
North Branch	W. H. Dalton	F. Bailie	W. H. Dalton.
	Crumlin.		
Proof Line	A. Anderson, Arva	N. Simbert	A. Anderson.

Metcalf Township.

* Kerwood	Wm. Waddell	Wm. Waddell	Wm. Waddell.
	Kerwood.		
* Siftons	Mrs. Wm. Sifton	H. Lauden	A. Anderson.
	Cairngorm.		

Nissouri, W., Township.

x Blanshard & Nissouri	Wm. Elgie, Belton	Jas. Davis, St. Marys	W. J. Murphy, Welburn.
Evelyn	Jenkins & Loughlin	W. Day, Thamesford	C. Jenkins.
	Evelyn.		
x Thorndale	Wm. Henderson	G. Vining	M. J. Kenney.
	Thorndale.		
x West Nissouri	Thos. Beddgood	J. Duffin, Thorndale	J. Reynolds, Leesboro.
	McWilliam.		

Westminster Township.

Belmont	Wm. Fitzpatrick	D. Taylor, Belmont	W. A. Chivers.
	Belmont.		
Glanworth	Geo. Brodie	D. McColl	Geo. Brodie.
	Glanworth.		

LIST OF CHEESE FACTORIES IN WESTERN ONTARIO.—*Continued.*

MIDDLESEX COUNTY.—*Continued.*

Westminster Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Pond Mills	Jas. Grieve, Pond Mills.	A. Elliott	Jas. Grieve.
Scottsville	C. Donnelly, Scottsville.	Mrs. William Scott	C. Donnelly.
White Oak	A. E. Shapland, White Oak.	Miss L. Flawn	A. E. Shapland.
Westminster	Wm. Fitzpatrick, Belmont.	D. Walker	M. Chivers.

NORFOLK COUNTY.

Charlotteville Township.

Lynedoch	C. O'Mahoney, Lynedoch.	C. O'Mahony	C. O'Mahoney.
St. Williams	E. Morrison, St. Williams.	R. A. Matthews	E. Morrison.
Vittoria	J. Pow, Vittoria	J. Pow	M. Showers.
Walsh	W. Rollings, Walsh	W. Rollings	W. Swick.

Houghton Township.

Clear Creek	B. A. Holland, Clear Creek.	Miss Williams	B. A. Holland.
Fairground	Jno. Brown, Fairground.	J. Crawford	Jno. Brown.

Middleton Township.

* Courtland	Frank Travis, Courtland.	O. E. Twiss, Tilsonburg.	Frank Travis.
South Middleton	Jno. Francis, Eden	Jno. Francis, South Middleton.	Jno. Francis.

Townsend Township.

Boston	J. Gobles, Boston	H. Barber	Geo. Hunter.
Rockford	W. R. Shearer, Villa Nova.	W. R. Shearer	H. Bingleman.
Tyrrell	W. R. Shearer, Villa Nova.	W. R. Shearer	Ward Rice, Tyrrell.
Villa Nova	W. W. Smith, Villa Nova.	W. W. Smith	W. W. Smith.
Waterford	L. Green, Waterford	L. Green	L. Greeu.

Walsingham, North, Township.

Carholme	J. Moffatt, Carholme	M. Smith	H. Carson.

Walsingham, South, Township.

Erie View	J. W. Ostrander, Erie View.	J. W. Ostrander	J. W. Ostrander.

Windham Township.

Bookton	W. J. McIllwraith, Bookton.	N. McCurdy	W. J. McIllwraith.
Nixon	W. H. Byerly, Nixon	W. H. Byerly	W. H. Byerly.
Windham Centre	D. Ferris, Windham Centre.	R. E. Green, Windham Centre.	D. Ferris.

LIST OF CHEESE FACTORIES IN WESTERN ONTARIO.—*Continued.*

NORFOLK COUNTY.—*Continued.*

Woodhouse Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
* Black Creek	J. J. Parsons, Jarvis	J. J. Parsons	W. J. Cameron. Port Dover.
x Excelsior	J. C. Blaney, Renton	W. H. Olds, Simcoe	W. L. Whiting.
Lynn Valley	R. W. Caswell Lynn Valley.	Geo. Potts, Simcoe	C. Caswell.

OXFORD COUNTY.

Blandford Township.

*xBright	W. C. Shearer, Bright.	W. G. Henderson	R. Johnston.
x Eastwood	Thos. Miller Eastwood.	E. M. Hersee	A. C. Herron.
x East Zora & Blanford	Wm. Breckenridge. Innerkip.		

Blenheim Township.

*xSoho	Walter Murray Drumbo.	A. L. Easton	W. T. Oliver.

Dereham Township.

Brownsville	Wilford & Grieve Ingersoll.	H. Branen Brownsville.	Jno. Skelton, Brownsville.
* Culloden	Jno. Borland Culloden.	H. Brown	Jno. Borland.
Dereham & W. Oxford	W. Nancekivell Ingersoll.	Wm. Piper	J. L. Brown.
Delmer	Caddy & Minshall Ingersoll.	Wm. Brown Ostrander.	Ed. Walthers, Delmer.
Mt. Elgin	Wm. Pow, Mt. Elgin.	J. Morrison	J. Baskett.
New Lawson	C. Harrison Holbrook.	C. Harrison	C. Harrison.
Prouse	O. Cuckow, Ostrander.	F. Small	O. Cuckow.
Salford	W. H. Wilford Salford.	Jas. Mayberry Ingersoll.	N. Baskett.
x Tillsonburg	W. S. Scott Tillsonburg.	N. Cuthbertson	Wm. Swartz.
Verschoyle	Jas. McKenzie Verschoyle.	I. Harris	J. McKenzie.

Nissouri, East, Township.

East Nissouri	Connolly Bros. Thamesford.	J. McCall	Connolly Bros.
* Farmers' Union	W. J. Atkinson Medina.	J. Bolton, Wildwood.	W. J. Atkinson.
x Kintore	W. Henderson Pasadena.	J. Sutherland Medina.	Alex. McCallum, Kintore.
Oliver	W. J. Atkinson Medina.	J. McKay, Oliver	Bobt. Atkinson.
Thamesford	Chas. Jenkins. Thamesford.	D. Lawrence	C. Jenkins.

Norwich North, Township.

D. & N. Union	A. W. Darroch, Zenda.	W. Banbury, Newark.	A. W. Darroch.
* Burgessville	J. McHoover Burgessville.	W. H. Kneal.	J. McHoover.
* Losee	Jno. Eccles, Norwich.	A. Cohoe	Jno. Eccles.
* Newark	Fred. Snell, Newark	F. Abraham	Fred. Snell.
* Norwich Gore	Robt. Snell, Norwich.	R. Weaver	B. Vannatter.
* Norwich Junction	Jno. Herron Norwich.	Jno. Herron	J. Herron.

LIST OF CHEESE FACTORIES IN WESTERN ONTARIO.—*Continued.*

OXFORD COUNTY.—*Continued.*

Norwich, South, Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Millers	J. Wilford, Ingersoll	F. Goodwin, Tillsonburg.	H. Williamson, Tillsonburg.
* Springford	Robt. Myrick, Springford.	Robt. Myrick	Robt. Myrick.
Summerville	Fred. Cornell, Otterville.	G. Troffry, Hawtry	F. Cornell.

Oxford, East, Township.

* Brockbank	Geo. Rice, Tillsonburg	Geo. Rice	G. R. Stone, Curries.
x Diamond	H. L. Hedges, Muir	Wm. Armstrong	C. H. Pike.
* East Oxford	T. W. Scidmore, Beaconsfield.	A. Curry, New Durham.	W. Lockyer.
*xE. & W. Oxford	M. Schell, Woodstock	F. Currie	C. A. Barber.
Vandecar	Ed. Hunter, Woodstock.	Wm. Sage, Vandecar	W. S. Feirheller.
Virtue	P. Callan, Woodstock	R. Amos	P. Callan.

Oxford, North, Township.

Banner	B. Crawford, Banner	W. T. Ovens, Thamesford.	B. Crawford.
Maple Leaf	Thos. Caddy, Ingersoll.	R. Gordon, Banner	H. Wade.
North Oxford	G. M. McKenzie, Ingersoll.	A. Dunn	G. M. McKenzie.

Oxford, West, Township.

Foldens	J. C. Barrett, Foldens	R. Davies	J. C. Barrett.
Sweaburg	Wm. Dunn, Sweaburg.		Wm. Dunn.

Zorra, East, Township.

*xCassell	H. Bollert, Cassel	S. Robinson, Cassel	O. R. Francis.
x German Union	H. Mantz, Tavistock	R. J. Kerr, N. Hamburg.	H. J. Neeb.
*xInnerkip	Jas. Hotson, Innerkip	A. Miller, Woodstock	E. M. Johnston.
*xStrathallan	A. R. Murray, Hickson.	M. Harwood	W. A. Bothwell.
*xSpring Creek	Edward Harwood, Woodstock.	A. McKay	J. L. Talbot.

Zorra, West, Township.

x Bennington	H. McCorquodale, Bennington.	Jno. McKay, Embro	F. A. Thompson.
*xBrooksdale	Jas. Slater, Brooksdale.	A. McDonald	A. D. Riddell.
Red Star	J. Brown, Ingersoll	T. Thornton	J. Brown.
West Zorra	J. H. Williams, Embro.	A. Murray	J. H. Williams.

PERTH COUNTY.

Blanchard Township.

Blanchard	J. Proudlove, Rannoch.	G. B. Webster, Science Hill.	J. Proudlove.

Downie Township.

*xAvonbank	B. Muir, Avonbank	Wm. Tier	J. T. Humphrey.
*xBlack Creek	Thos. Ballantyne, Stratford.	Thos. Ballantyne	Jno. Cuthbertson, Sebringville.

LIST OF CHEESE FACTORIES IN WESTERN ONTARIO.—*Continued.*

PERTH COUNTY.—*Continued.*

Downie Township.—Continued.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Maple Grove	Murray & Murray, Avonton.	W. Murray	J. Carter.
x St. Paul	Jno. Thistle, St. Paul's.	A. Bradshaw	J. Lawrence.

Ellice Township.

Classic	D. A. Dempsey, Stratford.	D. A. Dempsey	H. Hastings.
x Ellice & Logan	J. Brown, Rostock		L. Schneider, Rostock.
Sebringville	Jno. Robinson	J. Litt, Sebringville.	J. Robinson.

Elma Township.

*xDominion	T. Dickson, Atwood	R. A. Thompson	R. A. Thomson.
Donegal	W. Gamble, Donegal	E. Vipond	W. Gamble.
x Elma & Mornington	Mr. Watson, Burns	Mrs. Alexander, Britton.	W. S. Stocks, Britton.
Elm Bank	J. Cleland, Listowel	J. Cleland	J. Cleland.
Maitland	B. Howes, Atwood	J. R. Hammond	B. Howes.
Monkton	J. Knipe, Monkton	J. Holman	W. Hamilton.
Newry	Miss Mary Morrison, Newry.	Miss Mary Morrison	Miss Mary Morrison.
Silver Corners	R. Hastings, Atwood	J. Thomson, Henfryn	R. Hastings.
x Trowbridge	R. Moore, Trowbridge	G. Adams	J. E. Delmage.

Fullarton Township.

Fullarton	Chas. Lander, Fullarton.	Chas. Lander	Chas. Lander.

Hope, N.E., Township.

* Avondale	W. J. Stewart, Brocksden.	W. J. Stewart	W. J. Stewart.

Hope, S.E., Township.

* Tavistock	Ballantyne & Bell, Tavistock.	A. T. Bell	Ray Waddle.

Logan Township.

Willow Grove	J. E. Stacey, Mitchell	J. E. Stacey	J. E. Stacey.

Mornington Township.

Carthage	C. Klockman, Carthage.	R. Gamble	C. Klockman.
Honey Grove	A. F. Clark, Poole	J. Chalmers	F. Townsend.
x Millbank	D. Chalmers, Millbank.	W. Young	E. Norman.

Wallace Township.

x Marion Beaver	W. J. Mallett, Palmerston.	G. V. Poole	J. W. Claridge.
x Wallace	W. Matthews, Listowel.	W. Manning	J. E. Stedelbauer.

LIST OF CHEESE FACTORIES IN WESTERN ONTARIO.—*Continued.*

SIMCOE COUNTY.

Nottawasaga Township.

Name of Factory.	Proprietor or President.	Secretary.	Maker.
Avening	W. A. McLaren Avening.	W. A. McLean	W. A. McLean.
Victoria	Geo. Ludlow, Victoria		Geo. Ludlow.

WATERLOO COUNTY.

Wilmot Township.

*x Oak Grove	Jno. Weber New Hamburg.	Geo. Cousins	Geo. Cousins.

Wellesley Township.

Wellesley	W. Burgener Wellesley.	E. Klein, Hawkesville	W. Ratz.
Hawkesville	J. Thompson	M. Proudlove	J. Thompson.

WELLAND COUNTY.

Crowland Township.

x Union	L. Irwin, Welland	F. Jennings	W. L. Foster.

Wainfleet Township.

Forks Road	E. Ginther, Winger	A. Gleason	E. Ginther.

WELLINGTON COUNTY.

Arthur Township.

x Conn	J. Hunter, Conn	J. Hunter, Egerton	R. Nickle, Conn.

Maryboro Township.

x Rothsay	D. Wilson, Rothsay	W. Wilson, Rothsay	R. A. Treleaven.
x Wyandotte	R. McArthur Moorefield.	A. McArthur	T. Grieve.

Minto Township.

Cotswold	A. Ross, Cotswold	Jas. Ross, Cotswold	Jas. Ross.
x Harriston	J. McMurchie Harriston.	M. Morrison	M. Morrison.

Peel Township.

x Goldstone	T. Whale, Goldstone	J. McDougall	G. Lorch.

WENTWORTH COUNTY.

Ancaster Township.

Alberton	Jno. Hunter Alberton.	J. Hunter	J. Hunter.
Renforth	J. Mayhew, Renforth	D. Hamilton	J. Mahew.

Beverly Township.

x Lynden	S. Lemon, Lynden	H. Howard, Lynden	L. Tinning.

Binbrook Township.

Woodburn	W. B. Thomson Woodburn.	A. Jarvis	W. B. Thomson.

LIST OF CREAMERIES IN EASTERN ONTARIO.

Durham County.

Clarke Township.

Name of Creamery.	Proprietor or President.	Secretary.	Maker.
Orono	McFeeter & Ball, Orono.	J. W. Ball	J. W. Ball.

Glengarry County.

Kenyon Township.

Maxville	W. A. Roe, Maxville.	W. A. Roe	W. A. Roe.

Haliburton County.

Glamorgan Township.

Gooderham	J. E. Conkell Gooderham.	J. E. Conkell	J. A. Conkell.

Somerville Township.

Kinmount	Graham Bros. Kinmount.	Graham Bros.	A. Southworth.

Hastings County.

Faraday Township.

Bancroft	Wm. Gable Bancroft.	Wm. Gable	Mrs. Wm. Gable.

Northumberland County.

Hamilton Township.

Harwood	Southworth Bros. Harwood.	S. Southworth	S. Southworth.

Ontario County.

Brock Township.

Brock	Thos. Philips Cannington.	Thos. Philips	L. Southworth.

Mara Township.

Gamebridge	Newman Bros. Lorneville.	B. Stacey	L. Anderson, Gamebridge.

Rama Township.

Rathburn	Newman Bros Lorneville.	B. Stacey	J. P. Lamb, Rathburn.

Reach Township.

Port Perry	Jas. Stonehouse Port Perry.	Jas. Stonehouse	Jas. Stonehouse.

Thorah Township.

Eden	R. E. Gunn Beaverton.	R. E. Gunn	B. Payne.

LIST OF CREAMERIES IN EASTERN ONTARIO.—*Continued.*

ONTARIO COUNTY.—*Continued.*

Whitby Township.

Name of Creamery.	Proprietor or President.	Secretary.	Maker.
Brooklin	Patterson & Campbell, Brooklin.	R. G. Campbell	E. E. Patterson.

PETERBORO COUNTY.

City of Peterboro.

Peterboro	P. Downham	P. Downham	A. E. Juby.

PRINCE EDWARD COUNTY.

Picton Township.

St. Lawrence	R. H. Ashton, Morrisburg.	R. H. Ashton	Ivan Publow, Picton.

RENFREW COUNTY.

Hagarty Township.

Killaloe	Wm. Hock, Killaloe	Wm. Hock	Wm. Hock.

Horton Township.

Renfrew	Jno. Anderson, Renfrew.	Miss E. Airth	J. Anderson.

Pembroke Township.

Pembroke	A. Taylor, Pembroke	A. Taylor	C. Christenson.

Wilberforce Township.

Eganville	J. Childerhose, Eganville.	J. Childerhose	J. W. Falconer.

SIMCOE COUNTY.

Tecumseh Township.

Beeton	Thomas & McIntyre, Beeton.	R. A. Thomas, Barrie.	Mr. McIntyre.

Vespra Township.

Barrie	R. A. Thomas, Barrie.	R. A. Thomas	R. A. Thomas.

VICTORIA COUNTY.

Bexley Township.

Coboconk	J. Ham & Son, Coboconk.	J. A. Ham	Arthur Dayman.

Eldon Township.

Eldon	Newman Bros. Lorneville.	B. Stacey	I. J. Newman.

Fenelon Township.

Fenelon Falls	H. A. McIntosh, Fenelon Falls.	H. A. McIntosh	M. Stillman.

LIST OF CREAMERIES IN EASTERN ONTARIO.—*Concluded.*

VICTORIA COUNTY.—*Continued.*

Name of Creamery.	Proprietor or President.	Secretary.	Maker.
	Mariposa Township.		
Oakwood	Jno. Brady, Oakwood.	G. B. Rennie	C. A. Davies.
	Ops Township.		
Victoria	M. J. Lewis, Lindsay.	W. F. O'Boyle	M. J. Lewis.

YORK COUNTY.

	Markham Township.		
Locust Hill	Reesor Bros. Locust Hill.	Albert Reesor	Reesor Bros.

CREAMERIES IN WESTERN ONTARIO.

BRUCE COUNTY.

Annabel Township.

*Combined cheese and butter factories.

Name of Creamery.	Proprietor or President.	Secretary.	Maker.
Wiarton	Thos. Scott, Wiarton	Thos. Scott	Thos. Scott.
	Arran Township.		
Tara	Gerolamy, Canning & McMillan, Tara.	J. A. Canning	D. McMillan.
	Brant Township.		
Walkerton	Gunn's Ltd., Toronto.	R. M. Player Walkerton.	A. McLean, Walkerton.
	Bruce Township.		
x Underwood	Wm. Airth North Bruce.	M. McDuff, N. Bruce.	H. N. Carr, Underwood.
Tiverton C. & B. Co.	Alex. Kirkconnell, Tiverton.		
	Culross Township.		
Star	S. R. Brill, Teeswater.	S. R. Brill	Alex. Passmore.
	Elderslie Township.		
Chesley	Lackner & Stanley, Chesley.	R. Stanley	Jno. Lackner.
Paisley	Irwin & Loggie Paisley.	Jno. Loggie	Jas. Walker.
	Kincardine Township.		
*xClimax	Alex. Kirkconnell. Tiverton.	A. E. Ord, Tiverton	R. Aldrich, Tiverton.
	Kinloss Township.		
x Whitechurch	Frank Henry Whitechurch.	Mack Ross Whitechurch.	J. H. Sparling, Whitechurch.

CREAMERIES IN WESTERN ONTARIO.—*Continued.*

BRANT COUNTY.

South Dumfries Township.

Name of Creamery.	Proprietor or President.	Secretary.	Maker.
St. George	J. Malcolm & Son, St. George.	Jas. Malcolm, St. George.	Robt. Baird, St. George.

DUFFERIN COUNTY.

East Luther Township.

Grand Valley	Fred. Moore, Grand Valley.		W. Holmes, Grand Valley.

ELGIN COUNTY.

Dunwich Township.

Strathcona	R. E. Fraser, Dutton.	R. E. Fraser	R. E. Fraser.
Wallacetown	A. Keillor	A. Keillor	C. Keillor.

Southwold Township.

*	West Magdala	R. R. Cranston, Lawrence Sta.	R. R. Cranston	R. R. Cranston.

Yarmouth Township.

Elgin	Geo. Crocker. St. Thomas.	Miss N. McKenzie	Jas. Bristow.

ESSEX COUNTY.

Colchester Township.

Farmers' Friend No. 2.	W. S. Downham, London.	W. S. Downham	A. C. Cunningham, Harrow.

Maidstone Township.

Farmers' Friend No. 1.	Fairbairn & Doyle, Essex.	Fairbairn & Doyle	G. W. Doyle.

Tilbury Township.

Fleur-de-leiu	Allen & Allison	J. H. Allen, Wheatley	Hugh Allison.
		Comber.	

GREY COUNTY.

Collingwood Township.

Beaver Valley	W. H. Peterson, Thornbury.	W. H. Peterson	C. A. Metcalf.

Egremont Township.

x	Egremont Creamery Co.	David Allan, Jr., Holstein.	W. J. Sharpe, Holstein.	D. Cameron, Holstein.

Normanby Township.

x	Alsfeldt	Geo. Herbert Alsfeldt.	J. H. Ellis, Alsfeldt	Alex. McLachlan, Holstein.
x	Ayton Creamery Co	Jas. Booth, Ayton.	R. S. Fortune, Ayton.	O. Widmeyer, Ayton.
x	Neustaudt	Jos. Gettler, Neustadt.	J. J. Weinart, Neustadt.	B. Benninger, Neustadt.

CREAMERIES IN WESTERN ONTARIO.—*Continued.*

GREY COUNTY.—*Continued.*

Sydenham Township.

Name of Creamery.	Proprietor or President.	Secretary.	Maker.
x Owen Sound		Jno. McQuaker, Owen Sound.	J. A. McFeeters, Owen Sound.

HURON COUNTY

Ashfield Township.

River Valley	Ayer & Co., Montreal and Blythe.	and Powell, A. Disher, Dungannon.	M. Renninger, Dungannon.

Osborne Township.

Winchelsea	W. G. Medd, Winchelsea.	W. G. Medd	W. G. Medd.

Morris Township.

Brussels	W. W. Harris, Brussels.	W. W. Harris	F. Durdle.

McKillop Township.

Winthrop	A. Calder, Winthrop.	A. Calder	A. Calder.

Stephen Township.

x Corbett	J. R. McPherson, Corbett.	W. T. Ulens, Corbett.	I. C. Goodland.
Exeter	Jno. H. Scott, Exeter.	Jno. H. Scott	Jno. H. Scott.
Shamrock	Thos. Willis, Centralia.	Thos. Willis	Thos. Willis.

Turnberry Township.

x Bluevale Creamery Co.	Jas. Elliott, Bluevale.	Jno. Burgess, Bluevale.	F. Keyes, Bluevale.

HALDIMAND COUNTY.

Moulton Township.

King Edward	Jas. M. Phillips, Dunville.	Jas. M. Phillips	Jas. M. Phillips.

Walpole Township.

Imperial	Wm. Parkinson, Jarvis.	Wm. Parkinson	C. Parkinson.
Union	A. Aldrich, Selkirk.	A. Aldrich	A. Aldrich.

HALTON COUNTY.

Trafalgar Township.

Halton		Miss J. C. Irwin, Milton.	Geo. Reesor, Milton.
Palermo	City Dairy Co., Toronto.	City Dairy	W. Scott, Palermo.

Nelson Township.

x Nelson		G. N. Peer, Freeman.	S. M. Sinclair, Nelson.

KENT COUNTY.

Camden Township.

Dresden	W. H. Brubacker, Dresden.	W. H. Brubacker	W. H. Brubacker.

CREAMERIES IN WESTERN ONTARIO.—*Continued.*

KENT COUNTY.—*Continued.*

Chatham Township.

Name of Creamery.	Proprietor or President.	Secretary.	Maker.
Maple City	C. E. Lister, Chatham	C. E. Lister	W. J Lister.

Gore of Chatham Township.

Clover Lawn	Geo. E. Wooliver. Wallaceburg.	Geo. E. Wooliver,	E. A. French.

Howard Township.

Ridgetown	Jas. Ireland	Jas. Ireland	Wm. Brown.

Raleigh Township.

Merlin	Wm. Parker, Merlin	J. M. Holiday	Robt. Pepper.

Romney Township.

Maple Leaf	J. H. Allen Wheatley.	J. H. Allen	D. D. Allen.

LAMBTON COUNTY.

Rosanquet Township.

x Forest	Wm. Hill, Forest.	T. Leonard, Forest	M. Jackson, Forest.

Brooke Township.

* Inwood	R. J. Richardson Inwood.	A. Wilks	Chas. Hanley.

Enniskillen Township.

x Lambton	J. E. Armstrong Petrolia.	G. M. Cary	W. McPhail.

Moore Township.

*xBrigden	Jno. Duncan, Brigden	Jas. Doolan	Jno. Clubb.

LINCOLN COUNTY.

Gainsborough Township.

x Silverdale	Pure Milk Co. Hamilton.	W. H. Forster Hamilton.	Jno. Almont, Welland.

MIDDLESEX COUNTY.

Adelaide Township.

* Keyser	H. E. Wilson, Keyser.	Mrs. Davidson	J. E. Wilson.
* Kerwood	Wm. Waddell Kerwood.	Wm. Waddell	J. A. Waddell.
Vanneck	W. K. McLeod Vanneck.	W. K. McLeod	J. Scott.

Biddulph Township.

Lucan	J. F. Babb, Lucan	J. F. Babb	A. W. Bowles.

Caradoc Township.

*xMuncey	Jno. Stewart. Burwell Rd.	Geo. Carruthers. Christina.	R. Wood.

CREAMERIES IN WESTERN ONTARIO.—*Continued.*

MIDDLESEX COUNTY.—*Continued.*

Ekfrid Township.

Name of Creamery.	Proprietor or President.	Secretary.	Maker.
x Glencoe	Lambton Creamery Co. Petrolia.	Levi Smith, Glencoe	Levi Smith, Glencoe.

Lobo Township.

Cedar Springs	W. J. Hopkins Komoka.	G. A. Blackwell	W. J. Hopkins.

London Township.

Medway	Jas. Carmichael, Arva.	Jas. Carmichael.	W. B. Dinwoodie.

NORFOLK COUNTY.

Walsingham, N., Township.

Cedar Valley	A. H. Wheeler, Walsingham C.		

OXFORD COUNTY.

Blenheim Township.

Princeton	A. D. Lamont Princeton.	R. Coston	H. W. Parry.

Dereham Township.

x Brownsville	B. A. Gould, Toronto.	Chas. Jacques Brownsville.	Robt. McArthur. Brownsville.

North Oxford Township.

Beachville	Thos. Huntsley Woodstock.	T. R. Huggins Beachville.	C. A Huntsley.

PEEL COUNTY.

Caledon Township.

Alton	J. B. Smith, Alton	J. B. Smith	J. B. Smith.

PERTH COUNTY.

Blanshard Township.

x St. Mary's	Robt Dickson St. Mary's.	S. Fraleigh	A. A. Miller.

Downie Township.

Stratford	D. A. Dempsey Stratford.	D. A. Dempsey	Jas . Hamilton.

Logan Township.

Whirl Creek	S. D. Jackson Mitchell.	S. D. Jackson	S. D. Jackson.

WATERLOO COUNTY.

North Dumfries Township.

Nithside	D. McColl, Ayr	D. McColl	W. J. Powell.

CREAMERIES IN WESTERN ONTARIO.—***Concluded.***

WATERLOO COUNTY.—*Continued.*

Woolwich Township.

St. Jacobs	Snyder Bros St. Jacobs.	Snyder Bros	J. Keller.

Wilmot Township.

Name of Creamery.	Proprietor or President.	Secretary.	Maker.
x New Dundee	I. Lautenschlager Mannheim.	A. Bechtel, Baden.	O. Schweitzer. Baden.

WELLINGTON COUNTY.

Nichol Township.

Kinnettles	Jas. Wilson & Sons. Fergus.	J. Wilson & Sons	N. Cruikshank.

WELLAND COUNTY.

Bertie Township.

Point Albino	Jno. Sherks Ridgeway.	Jno Sherks	O. Raby.

WENTWORTH COUNTY.

Beverly Township.

Sheffield	J. Malcolm & Son. Sheffield.	J. D. Malcolm	J. D. Malcolm.

CHEESE FACTORIES PAYING BY TEST.

The following Cheese Factories in Western Ontario have introduced the system of paying for milk by test, instead of weight only. This test includes the determining of percentage of fat contained in the milk. As that quantity of cheese that can be made out of 100 lbs. of milk, varies with the quality of the milk, this system of paying for milk is much fairer than the general one of paying by weight.

Eastern Factories.

County.	Factories.
Carleton	Eagers No. 26, Minto, Twin Elm, Rockdale, Eagers No. 20, Keystone, Eagers No. 21, Goodwood No. 1, Jockvale, E. W. No. 7, M. P. F., Hazeldean.
Dundas	Inkerman, Toy's Hill, C. W. No. 1 Daisy, Levesque, No. 2, Dundas Star, Morewood.
Durham	Perryton.
Glengarry	Glen Norman, Glendale, Riverbank, Silvery Lily No. 2, Star No. 1, Lily White, Royal, Farmers' Pride, Farmers' Fancy, Glen, Glencoe, Silver Lily No. 1, Glendale, McGilvray's Bridge, Island.
Grenville	Roebuck, Hill Brook, Mainsville, Miller, No. 1.
Leeds	Wilstead, Lansdowne, Fairfax, Coldbrook.
Northumberland	Crown, Bensfort.
Ontario	Cedardale.
Prescott	Hawkesbury Dairy Co.
Peterboro'	Keene, Selwyn, Lakefield, Youngs' Point, Norwood, Warminster, Warsaw, Pine Grove, Lang, South Burleigh, Central Smith, Oakdale, Maple Leaf, Trewern.
Prince Edward	Mountain View.
Russell	Clover Leaf, McGregor No. 1, White Star, Millbrook No. 1, Navan, Kenmore, Hillside, Golden Globe, Farmers' Joy, P. Brisson, Minard No. 1, E. W. No. 29, Cambridge No. 5, St. Onge, R. No. 1, Levesque, Thrasher No. 3, River Side, Fraser No. 1, Fraser No. 2, White Clover.

Western Factories.

Elgin	Springfield.
Haldimand	Jarvis West.
Lambton	Galabank.
"	Uttoxeter.
Middlesex	Evelyn.
Norfolk	Thamesford.
Oxford	Brownsville, Cassel, Culloden, German Union, Innerkip, Soho, Spring Creek, West Zorra.
Perth	Avonbank, Black Creek South, Dominion, Donegal, Fullarton, Tavistock, Trowbridge, Newry, Willow Grove.

CHEESE FACTORIES HAVING A COOL-CURING ROOM.

The following factories in Western Ontario have installed cool-curing rooms. Some of these have been in operation for a number of seasons, and some have been equipped quite recently. The value of holding cheese at a cool temperature has been so well proven that the number of cool-rooms will continue to increase.

Eastern Factories.

County.	Factories.
Frontenac	Woodburn.
Grenville	Roebuck.
Hastings	Bronk, Spring Hill, Madoc, Thurlow, Foxboro, Sidney Town Hall, Frankford, Mountain, Bayside.
Lanark	Pakenham.
Leeds	Aberdeen, Rockdale, Greens, Caintown, Newbliss.
Lennox and Addington	Amherst Island, Camden East, Union.
Northumberland	Rogers, Avonbank, Brighton, Edville, Colborne, York Road.
Peterboro'	Central Smith, Shearer, Lang, Trewern.
Prince Edward	Weller's Bay, Quinte, Ben Gill, Waupoos, Bloomfield, Cherry Valley, Mountain View, Massassaga, Hyland.
Renfrew	Pine Grove (McNab).
Russell	Navan.

Western Factories.

Middlesex	Harrietsville.
Norfolk	Carholme, Thamesford.
Oxford	Bright, Cassel, East and West Oxford, Eastwood, Innerkip, Spring Creek, Sweaburg.
Perth	Avonbank, Black Creek (South), Dominion, Tavistock, Trowbridge.
Wellington	Goldstone.

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